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ABSTRACT

In this conference on safety and sports, conducted by the American School and Community Safety Association, five major topics were discussed. The first item concerned injuries in physical activities, the prevention of injuries in sports and a report on a survey of athletic injuries and deaths. The second item covered was the subject of injury surveillance systems. The third topic discussed was issues and developments in sports safety in high school and college programs, as well as programs for women and general recreational programs. Standards in sports equipment and facilities, and programs to reduce serious athletic injuries was the fourth subject under discussion. In the concluding session, liability and litigation in competitive sports, informal sports, and recreation programs was discussed. Throughout the conference the responsibility of athletic coaches was emphasised. (JD)

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SPORTS SAFETY II

PROCEEDINGS

Second National Conference on Sports Safety

58

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SPORTS SAFETY II

Proceedings of the Second National Sports Safety Conference

Chauncey A. Morehouse, Editor
The Pennsylvania State University

Chicago, Illinois
October 15-17, 1976

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and
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FORWORD

This Second National Sports Safety Conference was a follow-up to the First National Sports Safety Congress held in Cincinnati in February of 1973. One of the principal sponsors of that first Congress was the Division of Safety Education of the American Association for Health, Physical Education and Recreation. The formal proceedings of the Congress, *Current Issues of Sports Medicine*, is still available from the AAHPER Publication Sales.

The Organizing Committee hopes that this Second Sports Safety Conference has established a suitable climate and provided the basis for organizing subsequent conferences dealing with sports safety. We feel it is imperative to periodically convene individuals from education, medicine, industry and other disciplines to share ideas and exchange the latest available information. Hopefully, these meetings will help to focus our combined efforts on the most pressing problems in sports safety. The American School and Community Safety Association (ASCSA) is the organization within the restructured American Alliance for Health, Physical Education, and Recreation that has replaced the Safety Education Division of the AAHPER, the sponsor of the First National Sports Safety Conference. Therefore, it is only fitting that the ASCSA should assume the principal leadership in the sponsorship of this Conference.

This Conference was in the planning for more than a year. In October, 1975, the Conference Organizing Commmittee met in Chicago and outlined the framework for the program. The Committee has endeavored to bring together outstanding individuals each of whom is a recognized expert, is actively involved, and is knowledgeable in a specific area of sports safety. The presentations of these individuals were truly outstanding.

Sports Safety II includes not only the formal presentations given in each of the designated sessions, but also the spontaneous responses of the speakers to questions posed by the Conference participants at the conclusion of each session. An added feature of this professional exchange was a series of four round table discussions held during the morning of the final day of the Conference. Each of these discussions coincided closely with one of the formal session topics and therefore, summaries are included as an integral part of these official proceedings. The summaries are listed in the table of contents and follow the question and answer period for the related topic.

As Co-chairmen we hope that these proceedings will provide the motivation for many individuals who are directly involved in organized sports and recreational activities to place greater emphasis on sports safety. It is also our expectation that these proceedings will be the second in a continuing series of publications which will emanate from future national sports safety conferences.

Gordon O. Jensen
Chauncey A. Morehouse
Co-Chairmen
Second National Sports Safety Conference

ACKNOWLEDGEMENTS

Sincere thanks and gratitude are extended to all the speakers who participated in the Second National Sports Safety Conference and whose presentations appear in these official proceedings. Inasmuch as this Conference did not have extensive financial support, it was necessary for these individuals to assume the responsibility for their own personal expenses to appear on the Conference program. This is substantial evidence of the dedication of these individuals and their commitment to increased safety in sports.

Special thanks is extended to the President, Sayers J. "Bud" Miller, and the Executive Committee of the newly formed Sports Safety and Health Care Society for serving as a Conference co-sponsor and to the Society for its significant financial contribution. Appreciation is also expressed to the commercial organizations for their financial support without which this Conference would not have been possible. These included:

Johnson and Johnson Company — Athletic Division
Monsanto Corporation — Division of Consumer and Recreational Products
National Sporting Goods Association
Nissen Corporation
Porter Equipment Company
Schutt Manufacturing Company
Wilson Sporting Goods Inc.

The ASCSA and the Conference Organizing Committee are indeed grateful to these organizations for their valuable contributions.

Thanks are also due to those persons who served as presiding officers at Conference sessions and moderators of round table discussions. These individuals were:

C. Frazier Damron, University of Wisconsin, Madison
Norman Johnson, Lincoln University, Jefferson City, Missouri
Robert Kirk, University of Tennessee, Knoxville
C. Everett Marcum, West Virginia University, Morgantown
Edward Mileff, Indiana University of Pennsylvania, Indiana

In addition to these discussion leaders, some of whom also served on the Organizing Committee, a vote of thanks is extended to John Fleming, Manager of the Public Safety Department within the National Safety Council. Not only did he serve as an official member of the Conference Organizing Committee, but he and his staff and colleagues were responsible for most of the detailed administrative arrangements with the Towers Hotel.

Finally, the support and assistance of the staff: Benton Clifton, ASCSA Consultant, Linda Moore, ASCSA Program Assistant and Stanley F. Peachar, President of ASCSA, are acknowledged.

Were it not for the combined efforts of all of these people and of Conference Co-Chairman Gordon O. Jensen, Wisconsin State Department of Education, this Conference would not have been successful.

C. A. Morehouse
Editor

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1. Stanley Pechar, ASCSA President, welcoming participants.
2. Dr. Fred Allman of Atlanta giving keynote address.
3. Dr. Allan J. Ryan, Editor of *The Physician and Sportsmedicine*
4. Kenneth S. Clarke of Penn State
5. Donald E. Herrmann of Wisconsin Interscholastic Athletic Association
6. Ben Harris of the National Safety Council.
7. George A. Peters of Los Angeles has the attention of Herbert T. Appenzeller, seated.

WELCOME FROM ASCSA

Stanley F. Pechar
President, ASCSA

I would like to cordially welcome everyone on behalf of the American School and Community Safety Association and on behalf of its Board of Directors. Some of the points that I had in mind have already been expressed, but I think the one thing I can say is that this association has a past history of initiating this kind of program thrust and we have been very satisfied with our past endeavors. The conference three or four years ago in Cincinnati has already been mentioned by the Co-chairman. This was the First National Sports Safety Conference. Two years ago we initiated, in conjunction with the National Safety Council, a research conference which was held right here in this room. So we have had a continuing program effort in sports safety and we feel an association of our type which is one of the few national non-profit organizations in the area of safety should be doing this kind of work which has been rewarding to us. Following the First Sports Safety Conference, *Current Issues in Sports Medicine*, was produced as a publication. This is one of several kinds of materials being published and we have already discussed with the Organizing Committee of this Conference and the Board of Directors, the publication of the proceedings of this Conference. I see it as a gratifying kind of program effort. It is not our only program thrust because sports safety is only one of the several areas that we have been interested in as an Association but it certainly is an important one, because we are part of an Alliance that has as one of its major concerns, the area of physical education and sport. So I think in that sense, we are very pleased that we were able to bring this Conference to fruition and I especially would like to thank the Organizing Committee for its efforts. If you have had a chance to glance through the program and have seen the quality and the type of people who are included in it, you'll agree we have the best, both in the overall content areas, as well as the speakers who are present. When I look at the program, I am particularly pleased.

So again, let me welcome everybody and I trust there will be an opportunity, since I'll be here and participating during the entire Conference, to meet many of those who I do not know. Again, many thanks for attending and I hope that this Conference becomes not only a professionally profitable experience but also an enjoyable one.

The Major Concerns and Challenges in Sports Safety

Fred L. Allman M.D.
The Sports Medicine Clinic
Atlanta, Georgia

"The safety of the people shall be their highest law," so said Cicero in 51 B.C.

I wonder how many of our law makers, our administrators, our coaches and athletes of today would agree with Cicero. Regardless of their response, however, there should be some agreement among those of us gathered here for this meeting that safety of the athlete should be our most sought after goal. James Michener, in his book "Sports in America," has established three criteria for evaluation of sports activities and programs. These are:

"I. *Sports should be fun for the participant.* They should provide release from tensions, a joyful exuberance as the game progresses, and a discharge of those aggressions which, if kept bottled up, damage the human being. If sports become a drudgery, or a perverted competition, or a mere commercial enterprise, something is wrong. I believe that sports should be fun whether one is actively participating, like the ancient Greeks, or watching, like the ancient Romans. In either case they ought to provide a spiritual catharsis, which cannot occur if participants are overly dedicated to winning, or if spectators allow their partisanship to get out of hand. This criterion of fun will become especially important when we inspect Little Leagues in baseball and Pop Warner teams in football, but it will also apply at every other level of sports in America. If the game isn't fun, it has lost at least half its justification, and there are many signs that in America some sports are no longer fun, to either the participant or the spectator."

"II. *Sports should enhance the health of both the individual participant and the general society.* I place this criterion at the apex of my value system. For me it takes percedence over everything else, and most of my conclusions will be incomprehensible if this goal is forgotten. I believe without question that the general health of the nation ought to be a concern of those who govern the nation, and the way in which we have allowed national health standards to decline in recent decades is a scandal for which schools, colleges and universities will one day be called to account. Specifically, a sport, to be effective, should place a demand upon big muscles, lung capacity, sweat glands, and particularly the heart. If it does not, much of the potential value of that sport is lost. Of course, prudent limits should be observed. Not many individuals should engage in a marathon run of 26 miles 385 yards, because that requires too much exertion. But I cannot consider croquet a serious sport, because it requires none. A rigorous application of this criterion to all the sports we engage in will produce surprising results."

"III. *Sports have an obligation to provide public entertainment.* I am by nature a participant rather than a spectator, and my whole sympathy lies with the sandlot where boys are playing rather than the stadium where professionals are offering an exhibition. One might therefore expect me to be prejudiced against spectator sports, and I might have been had I not spent much of my adult life abroad, studying various cultures and countries. The more I learned, the more apparent it became that all societies in all periods of history have needed some kind of public entertainment, and it has usually been provided by sports."

"Ancient Greece had its Olympiad and Rome its Colosseum. In the most distant corners of Asia Minor, I saw amphitheaters constructed by these civilizations because the rulers knew that the general citizenry required some kind of public entertainment. In Merida, in western Spain, I visited the enormous flat plain that had once been walled to a height of four feet and waterproofed so that when a river was led into the area a small lake resulted on which actual ships could engage in simulated naval battles. In Crete young men and women skillfully leaped on and off the backs of charging bulls, and I have always been impressed by the frequency with which games are mentioned in the Bible. Some of the most effective analogies of St. Paul were borrowed from the arena. Shakespeare, too, found examples in sports, and I have found only one society in which sports were not a functional part. The Hebrews of Biblical time held a low opinion of games and said so, but when they entered Greek and Roman society they became advocates, like their neighbors. In ages societies have looked to sports for entertainment, so that when the State of Alabama demands that its university provide first-class big-time football, it is acting within a historical tradition, and when the State of Louisiana spends $163,000,000 to build a Superdome, it is aping only what Greece and Rome did ages ago. I am completely in favor of public sporting spectacles, for they fill a timeless need, but I am confused as to who should provide them and under what type of public sponsorship."

I personally find no fault with these criteria, but I would like to think that the time has come for us to consider only one of these primarily — that of enhancing the health of both the individual participant and the general society.

If you agree with me that enhancing the health of our athletes is a primary goal, what then might we do that will help us to move toward this goal?

First, we must *challenge* those who say that injuries are inevitable in sports. Certainly, as Casey Clarke has so adequately shown, there is a calculated risk involved in sports participation. However, recent studies have also shown that with presently known information, athletic injuries could be reduced by more than 50% if the proposed methods were utilized by those involved in sports.

How important is the reduction of injury? It may mean having that star quarterback, flanker, or outstanding linebacker around at the end of the season as well as at the beginning of the season. These boys may make the difference in winning the championship or winning a key ball game. Yet they may not be there if the coach does not incorporate known methods of reducing injuries. Even more importantly their chance of making a beneficial contribution to society may be prohibited due to a disasibility.

Recently I received a report from the U.S. Consumer Product Safety Commission. They estimated that in the year ending June 30, 1975, there were 318,000 football related injuries treated in hospital emergency rooms around the country. That is, 318,000 seen in emergency rooms alone, and there are many more that just go to doctors. There are some boys that never go to the doctor or the emergency room. Many boys that I see in my office have never been to the emergency room. Really, if we are talking about 318,000 boys seen in the emergency room, then we must be talking about 6 or 700,000 boys that are injured or that have injuries related to football during football season or throughout the year. This includes unorganized as well as organized athletics. A very good statistical study in North Carolina over a five-year period, between 1969-1972, showed the number of injuries that occurred to nearly 9,000 boys. There were 8,776 student-athletes, and they had 4,287 documented injuries. Thus, in that series one out of every two boys sustained some type of athletic injury while he was participating in football.

There are an estimated 50,000 knee injuries requiring surgery each fall of each football season. Yet, as stated before, we have the means, the knowledge, and the methods of cutting these at least in half, if just the measures that we now know would be utilized.

A general outline of these methods might be called, The Ten Commandments of Injury

Prevention. They are as follows:

First of all, there should be a good pre-participation evaluation. Certainly, we have to know something about the boy before he begins to participate. There are certain youngsters who are not physically fit or emotionally ready for varsity athletic participation. But we need to know before they begin to participate; we need to cull out some of the unfit and the boys who need remedial measures.

Certainly, we need to have equitable competition, and that is the second commandment. In other words, we should not be putting a boy into competition who is not physically, emotionally mature enough to participate at the level which he has been placed. By the same token, we should not have a school that is triple-A, competing against a school that is A, particularly if that A school has only 15 boys out for sports, and the triple-A school has anywhere from 75-100 boys out for the football team. There is no way that this can be equitable. This will only lead to injury to those boys in which the competition is not fair.

The third commandment is conditioning. There must be good conditioning of our athletes. They have to be conditioned year-round. A coach cannot take an athlete, and in 2-8 weeks make him conditioned for a sport as vigorous, as rough, or as demanding as football. We have to have him on a year-round conditioning program; we have to prepare him for that activity. We all know how demanding a sport can be. It may be very aggressive, vigorous, and involve contact and pursuit. If we expect that athlete to get out there and do what we tell him to, he must be physically prepared. He has to have adequate endurance for the duration of the activity. He has to have the strength for the demands that might be placed on his muscular-skeletal system, so that he can respond safely. He has to have adequate flexibility to be prepared for any number of situations where excessive demands are placed upon the extreme range of motion of his joints.

Part of conditioning refers to acclimatization, so that he can safely compete in hot weather. This keeps him from having heat stroke or other heat ailments. There are usually 3-6 boys who die each year in the United States because the coach, the trainer, the doctor, or the administration did not take the necessary measures to keep that boy from dying. Heat stroke is an unnecessary death and an unnecessary illness, if one simply takes the precautions we know he should take for prevention.

The fourth commandment concerns equipment. It should be properly selected, properly fitted, and properly worn. One cannot take any simple piece of equipment and say that it is safe. Fortunately, in our organized athletics, the coaches have done a better job in selecting equipment than they have in the Little League or the unorganized off-school programs. These unorganized programs may have a youngster get out there and block and tackle with his head in a helmet that costs five dollars. What sort of protection can he get from that? Yet, the coaches are telling them to do things that they do not have the protection to do safely.

All pieces of equipment should be carefully selected — not just on a basis of who gives the lowest bid. I once heard John Glenn give a speech to the New York Academy of Sciences. Someone asked him how it felt to be up there circling the globe. He said that his first reaction was there he was way up there in a space ship which was built with fifteen hundred low bids. He was wondering whether he would make it back or not, since everything was done on a low-bid basis. Yet, many coaches are putting boys out there and asking them to do things with their bodies, because they think the boys have good protective equipment. In many cases, this equipment is very poorly selected. It is not the best available, it is not fitted to the individual, and it is probably handed down from year to year. The youngster on the B-team who is subjected to just as great stress as the number one varsity player, is often playing with equipment that is inferior. The helmet may not fit him at all. How important is the head? We will talk later about head and neck injuries, blocking and tackling, and various techniques which may be used. For many years I have advised athletes not to block or tackle with their heads. They have two shoulders, and they do not think with either one of them. A boy can function quite well with an injury to his shoulder, but a serious injury to the head stops all functioning and thinking. If he lives, he may become a vegetable.

The equipment has to be selected carefully and fitted properly. The athlete has to be made to know that the coach expects him to wear it in a proper way. We have seen a number of athletes that have missed vital games because of the so-called "hip pointer," a bruise to the iliac crest. This happened because either he was not wearing any hip pads or he had them so low that they were not protecting the iliac crest. These are preventable injuries. A boy could still get a mild bruise through his hip pad, but he will not get an injury serious enough to cause him to miss a game.

Having the best available equipment will not be helpful it if is not worn properly. It has to be important to the coach, or else it will not be important to his athletes. Coach Pepper Rodgers at Georgia Tech thinks that weight training is a very important part of his program. He has a coach who does nothing but work with boys on weights. I can tell you that it has made all the difference in the world, since the head coach feels that it is important. The boys know that he is going to ask them how much they can bench-press. If the coach asks questions of the athletes, they know that he thinks that it is important to them. Once they know that he thinks it is important, then they begin to attach a different significance to what he is saying. If it is not important to the coach that the athlete wear the protective equipment in the proper fashion, he may even omit certain pieces of equipment. Some of the pros now do not wear hip pads, and a few of the pros do not wear shoulder pads. The ones they do wear may be like putting cardboard over their shoulders for good mobility since the cardboard is light. The younger athletes may see this going on and say "This is for me." They say that they have big shoulders and do not need all that bulk up there. They get hurt and miss a few games, and this is unnecessary.

The fifth commandment is the playing facility. The North Carolina study that was recently completed found that it is possible to have a very significant reduction in knee injuries simply by clearing off and improving the surface of the playing field. Is it too much to ask that there is a practice and playing field that is unobstructed by rocks, pitholes, or things that might cause them to trip or slip? A coach spends a lot of time with X's and O's. I am simply asking coaches to spend a little bit more time to find out the condition of the surface where they are playing. The coach should see that there are as many obstructions removed as possible, because in doing so, this will reduce the number of injuries.

Coaching technique is the sixth commandment. Coaching technique is very important. The boy who wants to make the team is going to try to do the things that the coach wants him to do. If the coach tells him to do something that is hazardous, he is going to do something hazardous. If the coach teaches him to do it in another way that is just as effective, he is going to do it in the effective, safer way. The difference is that he is going to be around for the key ball game. He is going to be healthier since he learned to do it in a way that is safer, less harmful, and less likely to result in an injury.

Rules and regulations are the seventh commandment. The coach must teach the boys that the rules are there to protect them. Each and every athlete should be taught to play, not just within the rule itself, but within the spirit of the rule. Why was the rule made? It was made for his benefit. It was not made as a means of punishment; it was made as a means of helping to protect him. There should never be a more important consideration by the Rules Committee than the safety of the athletes.

Prompt care of an injury once it has occurred is the eighth commandment. When a boy gets hurt, the coach should see that he gets the necessary treatment. This might be a simple observation of the fact that maybe a bandaid needs to be placed on a blister. Maybe the new shoe needs to be changed or broken in more slowly. It may mean that the athlete needs to have surgery. Whatever the injury might be, prompt, proper care should be initiated immediately to enable full recovery in the shortest possible time.

Number nine is complete rehabilitation following an injury. The athlete who is injured must be ready to return to activities before the coach tries to get him back. The coach must not try to second-guess someone else in authority who says that the athlete is not ready to get back out there to play. He may be very important to the game, but unless he is ready to go out, he is not going to be as effective as the number-two man. Do not try to push him out there before he is ready.

Number ten is evaluation after they return to play following an injury. The coach has to watch the athlete, the doctor has to watch him, and if there is a trainer available, he has to watch him. They must determine if this youngster is as ready as the physician felt that he was at the time he went back to athletic activity.

Those are the Ten Commandments. I promise if the coaches will spend time and give a small percentage of their thought to prevention of injuries, they will have fewer injuries to their athletes. The Ten Commandments once again are: 1) A good pre-participation evaluation, 2) Equitable competition, 3) Conditioning, 4) Equipment, 5) Playing facility, 6) Coaching technique, 7) Rules and regulations, 8) Prompt care of an injury, 9) Complete rehabilitation, and 10) Evaluation after return to play following an injury.

Our second challenge, in addition to injury prevention *per se*, is that we must attempt to improve the physical and mental performance of our athletes. Few of us are truly appreciative of our capabilities. Yet we are unique throughout the entire universe, for where in the universe is there anything that compares to the "Great Human Machine." Nowhere else in nature has a job been performed more divinely. Three horsepower, firing from four billion cylinder-like muscle cells averaging 1/600 inch in diameter, 1½ inches in length, operating on sugar and fats at an overall efficiency of 25 to 30% — this is the human motor. There are some 60,000 billion cells in the human body. Many of these cells are found in some 434 individual muscles comprising 40% of the body's weight. These form a flesh mass which, though consisting of 75% water, is capable of pulling 140 pounds per square inch of cross section.

It has been calculated that the gastrocnemius of a human sprinter is capable of lifting six times his body weight. Just imagine, a calf muscle lifting six men! The total number of the muscle fibers in the human body has been calculated at a quarter billion. Were that quarter billion rigged to pull at one time in one direction, it could lift 25 tons.

And what of the Miraculous Heart? The five to six quarts of blood in each of the human machines is pumped by the heart around the body at least 1,500 times a day. The heart, creating a pressure of 2.9 pounds per square inch, ejects the blood with a velocity of 97.5 feet per minute. It is estimated that the two ventricles perform work equivalent of 0.1 kilogram-meters with each beat, or 10,000 kilogram-meters per day in a man at rest.

The heart beats a hundred thousand or so times a day and in an old man may beat as many as three thousand million beats in a lifetime. During an average lifetime, each ventricle will put out 150,000 tons of blood and do enough work to raise a 10 ton weight 10 miles.

With diminishing pressure the blood travels through the smallers arteries, then through any one of the 317 billion capillaries where in a brief second it performs its function before pouring into veins that bring it back to the heart. The length of the average capillary is 1/50 of an inch, and a bit of muscle the diameter of a pin might contain 700 muscle fibers, 200 capillaries and the 200 capillaries all open during work and all close during rest. The capillaries of an individual's body laid end to end and connected would make a hairbreadth pipe reaching several times around the earth.

When the body is at rest, the heart transports each minute 1/3 quart of oxygen from lungs to muscles, glands and nerves with a heart output of about 4 quarts per minute. In strenuous exercise, the demands for oxygen are greatly increased and the tireless pump responds accordingly. The heart of a trained athlete in action may pump over 40 quarts per minute, enough blood to carry 15 times as much oxygen from his lungs. This superior oxygen-capturing power distinguishes the trained men, from the untrained.

Man-made machines wear out with use. A brief breaking-in period brings them to perfection, after which they deteriorate with each succeeding revolution. Not so this great human machine! At birth, it is but a bundle of possibilities, that of growth, adjustment, renewal and self-perpetuation, and it will continue to remain effective for a long time if only a few simple principles are adhered to. As Alan Ryan has pointed out:

The process of growth and development of the body is self-initiating and continues spontaneously until it reaches its maximum, impelled by forces which are inherent in the body. At every age of its growth, however, the body is responsive to its environment and the final product represents the effect of the inner-action. When growth has reached its maximum, the process of aging enters the phase in which those factors which lead throughout life to degeneration and decay of the body become prominent, very gradually at first, and then more rapidly until senescence and death inevitably occur. Inter-reaction with the environment is extremely important in its effect on the rate of this decay.

Our human bodies are so constituted that they are capable of adaptation to a wide range of environmental circumstances. Man can survive in the coldest weather of Antartica and in the hottest temperature of the tropics. He can change his place of living from one of these extremes to the other by undergoing what we call a process of acclimatization. He can hold an egg shell in his hand without crushing it but he can also, with training, raise 400 pounds or more over his head. He can descend to the bottom of the sea and live there in an atmosphere of compressed air for a month and he can climb a mountain over 20,000 feet high without the use of oxygen equipment. He can jump over a bar more than seven feet high and over a distance of 29 feet along the ground, impelled solely by the force of his own effort, and he can run over 100 miles in one day.

It is only through a thorough understanding of the capabilities of the human body that an athlete can safely achieve a high performance level. Also there is need for scientific analysis of athletic capabilities at various ages and for both sexes. We need improved methods of evaluating performance levels and of determining what level of stress is beneficial, and what level harmful, for a given individual. Proper psychological and dietary counseling are other important aspects to be considered in improving performance safety.

Our third challenge is to take the necessary measures to ensure the availability of quality health supervision to all sports programs in all communities — North, South, East and West, urban, rural, black and white, male and female. This will entail more comprehensive undergraduate, graduate and postgraduate training of all medical and paramedical personnel in the medical aspects of sports.

Special consideration must be given to the availability of trained medical and paramedical personnel for attendance at athletic events. A certification program for such personnel for varied athletic events is essential if desired goals for immediate prompt proper treatment is to be available for all athletes.

Another very important area for concern is the hospital or clinic emergency room. All too often athletes are sent to the emergency room for evaluation of an injury and leave with little more knowledge than the fact that the X-ray was either positive or negative. Often no treatment is given for a serious sprain because the routine X-ray was negative.

It is also important that all medical personnel develop a better understanding of the physical demands which will be placed upon the organism while engaged in activity and upon return to a particular sports following recovery from injury. Without such understanding the athlete is likely to sustain re-injury due to inadequate healing and/or rehabilitation.

Our fourth challenge is to find ways and means of financing the medical care for injured athletes. We are all aware of the tremendous rise in medical costs in recent years but to the best of my knowledge no individual or organization has undertaken an evaluation of the causes and effects of increased costs for medical care of the injured athlete.

Although I do not have specific figures for sports injuries alone, I do have figures to illustrate the magnitude of overall medical costs.

According to statistics (1967) cited by the United States Department of Health, Education, and Welfare, approximately three and one-half million persons are presently engaged in occupations related to health services. This is in sharp contrast to two and one-half million just seven years previously and tenfold more than the manpower source at the turn of the century. According to the same source, the figure will rise to well over five million in a decade *if health care is simply to be maintained at the present level.*

In the year 1929, the United States spent three and one-half billion dollars for all medical care. This means in the light of the one hundred million Americans living at that time, the average cost per person per year was $35, or less than ten cents a day. In 1967-68, the nation spent $50 billion for two hundred million people. This is $250 per person per annum, or 68 cents daily for every man, woman, and child. For 1970 the cost of medical care reached $61 billion. This is five times the 1950 price and fifteenfold that of 1930. In 1971 the health care bill was a staggering $79 billion. Health care services in 1972 were almost $88 billion. Spending for health care is expected to rise at an annual rate of 8.5 percent throughout the seventies, reaching more than $113 billion in 1975 and almost $169 billion by 1980.

There is a second way to view the health economics problem. This is possible by analyzing the percentage of the national effort (the gross national product) which is utilized for medical care. In 1929, medical expenditures usurped 3.6 cents out of every dollar earned. In 1968-69, the figure had ballooned to 6 cents. The most up-to-date figure (1972) is that 8 percent of the gross national product will be swallowed up for medical purposes.

There is still a third way to assess the problem. In 1929 taxes paid for 13 percent of medical costs in the United States. Today it is 40 percent. Hence, there has been a greater than threefold increase.

Fourth, there are significant hospital figures. In 1965 hospital costs were rising at the rate of 8 to 9 percent per year. This was twice as fast as the rise in the cost of living. In 1963 hospital costs were projected to double in eight years. For example, hospitals like the Cornell Medical Center were charging about $60 per day. It was, therefore, estimated that in eight years (1971) the daily costs would climb to $120. Actually, the projections were quite accurate. For instance, many hospitals today charge $100 per day. The compounded rate of increase in 1968 was 15 percent. If this trend continues, it means that hospital costs will double again, this time in five instead of eight years. Thus, daily hospital rates could be as high as $400 by 1980. At that time a six-week heart attack will cost for hospital care alone, almost $17,000. According to American Medical News, hospital costs in the major urban areas could reach $1,000 per day within ten years. A college trainer recently told me that knee surgery for one of their athletes had cost more than $5,000.

Our fifth challenge is to support the establishment of an athletic injury data and retrieval system.

Casey Clarke and the Advisory Committee of the National Athletic Injury/Illness Reporting System are to be commended for the long hours and hard work under uncertain conditions to get NAIRS off and running. We all owe them any assistance that might be needed and I'm sure you will hear more about NAIRS later in the conference.

Our sixth challenge concerns correlation of financial and professional resources.

In my opinion the greatest problem concerning sports safety in this country is lack of national leadership. I don't mean to imply that there is no one outstanding in the field of sports medicine or sports safety or that there is no organization that is making a worthwhile contribution to sports medicine. On the contrary, I could stand up here all night and list people and organizations that have made tremendous contributions to sports medicine — and sports medicine has advanced a long way in recent years due to these people and these organizations but what I mean by lack of national leadership is that there is no organization that serves as an umbrella to correlate education or research activities relative to sports medicine. Consequently there is often duplication of costs and effort or even worse no funds and no effort in areas where both funds and effort are badly needed. I wish I had a solution to offer tonight but I don't. I hope in the next two days, thought will be given to this problem.

I would like to go on record however as being very much opposed to federal regulation, federal control, federal supervision or any form of active support by the Federal Government in sports medicine. The Federal Government doesn't have the knowledge, the money, the sincere motivation or capability to support the needs of sports medicine and sports safety.

Most of you are familiar with the way the federal bureaucrats operate — but just in case you need to be reminded, let me provide you with abstracted material from a recent article by a fellow physician that served with me on the AMA Committee on Exercise and Physical Fitness, Dr. Ted Klump, concerning the Food and Drug Administration.

PROBLEMS

- I. Escalating costs, personnel, paperwork
    - A. Appropriations: 2 million 1938; 200 million 1975-6 fiscal year
    - B. Staffing: 869 in 1956; 6100 in 1975
- II. Inefficiency, increasing beauracracy
    - A. Now takes 3 weeks to deliver a letter from mailroom to officer's desk
    - B. Frequent lost letters, files — requiring resubmission by drug companies.
    - C. Now takes 8-10 years and $8-10 million to produce a new drug (from discovery to FDA approval)
    - D. Most drug companies now must *hand deliver* all important documents — letters from NYC cost $75. instead of 13 cents

UNFORTUNATE RESULTS

- I. Serious "drug lag" in USA compared to other countries
    - Examples: Paul de Haen (NYC) has documented:
    - 1. 10 year delay (over Britain) in approval of methacrylate for total hip procedures
    - 2. Lasix — available in Germany & Britain years before USA
    - 3. Cromolym sodium (for asthma) & cotrimoxazol (for chronic pyelo) approved in Britain 1968, USA 1973 (5-year lag)
    - Result: Patients who *could* benefit, suffer
- II. Many drug companies are inhibited from developing new drugs for rare diseases or minor conditions because they will not be able to recoup development costs

HOW DO WE COMPARE WITH OTHER COUNTRIES?

- I. Britain does the same job (you don't have to be *less* careful for 100 million people than for 200 million) in less time, with less staff, and for less money.
    - Example: British Committee for Safety in Drugs — 1970 — staff: 20 USA, FDA Bureau of Drugs (alone) — staff: 900, with *total* FDA budget of $76 million.

WHAT ARE THE ROOTS OF FDA's PROBLEMS?

- I. Politics interferes with function
    - A. Thalidomide tragedy (FDA hadn't approved it yet due to beauracratic delays — FDA emerged heroic) still influences policy: DELAY as much as possible; perhaps something bad will turn up
    - B. Kefauver investigations began series of Congressional investigations — Congressional harrassment continues — as many as 4 committees at once, constantly over the last 10 years
    - Result: Interferes with day to day business — must prepare for defense
- II. Professional staff — poor
    - A. Unattractive to many highly trained people — too much politics
    - B. Civil service jobs favor "experience" and seniority — young, bright people are discriminated against by the system
    - C. Civil liberties, anti-discrimination forces make it virtually impossible to fire anyone — incompetents remain in the organization

POLICY MAKING PROBLEMS

I. Warped perspective
  A. "A drug that is safe for everyone is good for no one," Karl Beyer
  B. Unnecessary investigations — beyond reasonable ends
  Examples: 1. Drug coloring — tested extensively in ultra high doses 2. Toxicology in pregnancy — tests are not worthwhile — end up with blanket warning against use in pregnancy in all new drugs anyway
II. "Loaded" panels of experts frequently used: "You tell me the questions and the answers you want. I will appoint a panel of outstanding experts to give you those answers. But if you want different answers I will designate an equally outstanding expert panel to come up with those answers," Benno Schmidt, Chairman of President's Commission on Cancer
III. Double Standard — rigid scientific proof for drug usefulness, while flimsy evidence for toxicology and side effects (1)

Yes, the need for sports safety is great but let's not allow or encourage our bankrupt government the opportunity to do a job that we ourselves can do much better.

I started tonight by listing the Ten Commandments for prevention of athletic injuries. I would like to close by reciting the Ten Commandments for care of the injured athlete and then the Ten Commandments for being a better coach or leader.

THE TEN COMMANDMENTS FOR CARE OF THE INJURED ATHLETE

I. The Injured Athlete is not in a normal condition — he is in a state requiring medical attention and personal understanding.

II. The Injured Athlete is not a routine concern — he is an individual case requiring individual evaluation and treatment.

III. The Injured Athlete is deserving of the most courteous and attentive treatment we can give him.

IV. The Injured Athlete is not an interruption to our work — he is the purpose of our work.

V. The Injured Athlete is here because he needs to be — not necessarily because he wants to be.

VI. The Injured Athlete is not a cold statistic — he is a flesh and blood human being with emotions and feelings like our own.

VII. The Injured Athlete is not someone with whom we should argue or match wits.

VIII. The Injured Athlete deserves to be fully rehabilitated so that he may return safely and promptly to competition.

IX. The Injured Athlete is deserving of professional treatment by personnel who keep abreast of the latest knowledge and techniques of modern medical research as it relates to sports medicine.

X. The Injured Athlete is the most important person in our mission.

THE TEN COMMANDMENTS FOR BEING A BETTER COACH

I. I will determine my goals — distant, intermediate, and immediate — and I will write them down. Each day I will review these goals.

II. I will teach my players to respect their opponents — for a high level of competition will ultimately make them better athletes.

III. I will teach my players to strive for excellence for in so doing and overcoming obstacles they will achieve higher goals.

IV. I will teach my players to persist until they succeed and will never consider defeat — for with ordinary talent and extraordinary perseverance all things are attainable.

V. I will help my players to realize their unlimited potential and I will help them concentrate their energy on the challenge of the moment.

VI. I will teach my players that a man can only rise, conquer, and achieve by lifting up his thoughts — "they conquer who believe they can."

VII. I will teach my players to love their teammates for love gives the power of working miracles.

VIII. I will teach my players they can best serve their self-interest by subordinating personal pride to team effort.

IX. I will teach my players that strength can only be developed by effort and practice and that there can be no progress, no achievement without sacrifice.

X. Lastly, but most importantly, I will teach my players that faith is vital to accomplishment — that in actual life every great enterprise begins with and takes its first forward step in faith —

faith in me as their coach
faith in their teammates
faith in the great potential in themselves

and faith in God who has so honored them by making them unique throughout the whole universe.

In conclusion, the task that lies ahead — for the next two days, and after you return to your home — is demanding. But when the going gets tough, when you encounter the doubters, then try to remember that the cause is worthwhile for we are dealing with human lives.

Sir William Osler has said, "Nothing in life is more wonderful than faith. It is the one great moving force which we can neither weight in the balance nor test in the crucible." I have faith that those of you gathered here tonight will be able to accomplish much to help safeguard the health and lives of our athletes.

Reference

Klump, Ted. "The Food and Drug Administration: More Sinned Against Than Sinning?" *The Journal of Legal Medicine*. 4:25-31, September, 1976.

Question and Answer Period

Question: Of all the concerns that you cited, which one or two concerns do you place above all of the others? Which would you consider the most sensitive concern to you in light of your experiences at this point of time, in terms of sports safety across the entire spectrum, football and all other categories, and why?

Allman: I think it's the lack of "umbrella" leadership. And, the reason I say that is because it's an educational process. For example, I purposely neglected naming any organizations that have done a tremendous job because there are so many and I didn't want to leave any out, but since I'm an orthopaedic surgeon, I'll take as an example, the American Academy of Orthopaedic Surgeons. They have done a tremendous job in educating orthopaedic surgeons, those who are interested in and want to attend certain postgraduate programs. But even at this late date, with a committee that has been around for a long while now, we still do not have established criteria of curriculums within the medical schools or even within the orthopaedic training programs, indicating what should be covered in sports medicine. Many individuals graduate from these programs without knowing anything at all about sports medicine and many of them go to communities where they have a tremendous responsibility in this area. It's, "teach me" or "teach me through books" or "what can I do from what's available there" rather than a formal educational program. The same is true of our coaches. Very few of them really have a formally, structured program in the medical aspects of sport at any time during their educational career. Some schools, yes, but so far as the mass of coaches who are coming out, they do not. Very few states have certification of coaches. They are certified in school systems today to teach English, math, chemistry and everything else. Anybody who wants to, can go out and hire a coach and usually this is someone who is knowledgeable about X's and O's but really they may know very, very little about the medical care. The point I'm making is that the top priority should be the safety of the athlete. This is number one, not winning, not developing the athlete physically so much, as safeguarding his health, excluding some from participation, but finding something else that they can do commensurate with their capabilities. But, we do not have this type of leadership. The AMA has failed to take this initiative. They have done many good things but they have failed to get into other areas and provide support to other people. The American College of Sports Medicine has failed to do so. Everyone has their sphere of interest but there is no one that has congealed and brought all of these organizations together in such a way that everyone knows what the other one is doing, where priorities are placed on what will be done, where any attempt is made to get money at this level. Sure, we could keep on going, we could reduce injuries, we can go into a situation like that at West Point. John Powell is here and I'm sure he would be glad to comment. With an organized program, a perfected program, they were able to reduce the athletic injuries by 50%. This could be done in any community, with any team, it can be done. We know that there are certain communities that are doing this. But, the majority are not. So it is difficult to spread it from one community throughout the country. There has to be somebody at the top looking down, advocating some of these things and seeing that they are done. So, as far as I'm concerned, that is the greatest problem. I think next to that, the financial end is the next biggest, and I think it will be even more difficult to solve than the first one.

The Prevention of Injuries in Sports and Physical Recreation

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The relatively high rates of accidental injury are today a major threat to the further development of recreation which involves physical activity. Physical educators and physicians are agreed upon the desirability of a lifetime of vigorous activity as a means of promoting greater enjoyment of living and maintaining good health. The increasing availability of leisure time for our working population brought about by automation and other time-saving developments, improved means of transportation, better general education and a higher standard of living have all had their effect in increasing recreational activities immensely. The rapid rate and size of this growth have outstripped our plans and means for making and keeping these activities reasonably safe.

The prevention of sports injuries may be thought of in terms of the many different types of problems which are presented by the universality of sport. Sport as a more specialized form of play is a part of life and not a phenomenon of any time or place. The role which it has played in different cultures varies, and the forms which it takes may change, but the essence remains the same, giving rise to problems of control which are common to all times and places. We live in a time and a place where we have developed considerable interest in the solution of these problems. To some we have very satisfactory answers, but to others we can make only an inadequate response.

An accident is an unpredictable event only in the sense that the person or persons involved in it do not expect it to occur at that particular time. If the epidemiologist is given enough information about the circumstances of any given event involving people in motion, he can estimate what the possibility of various accidental occurrences will be and how often these may be expected to take place over a given period of time. The National Safety Council does this regarding the expected fatalities due to motor vehicle accidents on holiday weekends. Usually they come pretty close to the mark. As the result of experience in many fields they have said further that about 300 unsafe acts which would cause an accident take place before one actually occurs, and that there are about 29 accidental injuries for each disabling injury, and about 100 disabling injuries for each accidental death.

Put in other words, for safety to be effective it is not enough to try to prevent one death; you must prevent 900,000 unsafe acts in order to do this. Multiply this by the approximately 40,000 motor vehicle deaths now occurring in the United States annually and you can see why the problem of automotive safety is so complex. Driving an automobile is one of the most popular forms of recreation today, although it could hardly be called physical activity of a very high order unless one was involved in automobile racing.

In recreational pursuits which involve physical activity, and especially in sports, we perform thousands of unsafe acts. The very character of sports and games, since they are intensified and often competitive physical activities, gives assurance that the risk of accident will be greater than in the usual activities of daily living. Accidents, for example, are not only the major cause of death among both males and females aged 15 to 24 (accounting for 62% of the deaths in males and 37% in females), but are a major cause of disability in this age group. The National Health Survey shows that at the present time about 7 million young people of these ages suffer non-fatal injuries requiring a visit to a physician, one day of disability or both each year. One-fourth of these injuries occur at home and almost as many in school buildings and on school premises. A great proportion of these accidents occur in games and sports since they are a major preoccupation of young people in this age group.

The range of individual and group sports and physical recreational activities has broadened considerably in the last few decades. New sports seem to appear every year. Surfing, SCUBA diving, water skiing, snowmobiling, sports parachuting and sky diving have all blossomed out as mass participation sports in the past 20 years. Older sports such as snow skiing, boating, volleyball, bowling, ice skating, and automobile racing have experienced tremendous growth. Important in the overall surge has been the fantastic increase in the participation of girls and women in every one of the sports mentioned. Just to cite a few "ball-park" figures from the Nielsen Sports Survey for the year 1976, an estimated 103 million persons were swimming, 75 million persons were riding bicycles, 40 million playing volleyball, 39.3 million boating, 44 million bowling, 58 million camping, 64 million fishing, 25.8 million playing basketball, 25 million roller-skating, 22.5 million playing 12-inch softball, 20 million each ice-skating, playing table tennis and billiards and engaged in shooting sports, 14.9 million playing football, 10 million playing suffle-board, 9 million horseshoe-pitching, 8.75 million water-skiing, 29.2 million playing tennis, 8 million engaged in target archery, 16.6 million golfing, 9.2 million snowmobiling, 6 million playing handball, 11 million snow-skiing, and 3 million playing 16-inch softball.

Accidents, injuries and even fatalities occur in every one of these sports. Drownings in recreational swimming amount to several thousand each year and drownings in boating activities account for another thousand. The occurrence of serious injuries is apparently so high in both water-skiing and snow-skiing as to make them comparable with some of the so-called contact sports such as football, wrestling, ice hockey and basketball. In sky-diving and sport parachute jumping the injury rate is apparently very low but the fatality rate quite high.

The beginning of accident prevention is to acquire information about the occurrence of accidents in the activity in which you are interested and to try to identify the causes of these accidents. If this information on which some conclusions will be based is to be useful it must be reasonably accurate and complete. This is where the difficulties start with recreational sports.

Take the occurrence of accidents in snow-skiing as an example. One resort area may report that in the past five-year period, 1,052 persons have been treated for injuries at the small emergency hospital which they maintain at the foot of the main ski slope. Of these only 185 persons suffered fractures. They estimate that during the ski seasons of this period that 35,000 persons used their facilities for skiing. What might you conclude from this? That snow-skiing must be a relatively safe sport. Probably it is, but for whom and under what conditions?

Where did the figure of 35,000 persons come from? Was this the number of persons who registered at the lodge, the number who bought tickets for the ski tow, or was it based on a sampling of the number of cars parked in the parking lot? How many persons had season tickets for the tow and how many bought individual tickets on more than one day? How many days of snow suitable for skiing were there in each of the five seasons? How many hours during the day was the tow operating? How many runs did the persons using the tow average in a day? Were they predominantly young or old, men or women, experienced skiers or novices? How many took instruction and how did their experience compare with those who did not, and with experienced skiers? How many used their own equipment and how many rented it?

When it comes to the injuries themselves, even more pertinent questions need to be asked.

How many persons were injured who did not report to the first aid station for help but went home instead? How did their accidents occur? What type of equipment were they wearing? Did the binding release during the fall or perhaps even before the fall?

Questions like this have been asked by the National Ski Safety Research Project and by other investigators. The accumulation of material is painstaking, requiring an enormous amount of time, personnel and patience. Much of the data which has been painfully accumulated has had to be discarded because it is in a form which actually defies any meaningful analysis. It is doubtful whether the cost necessary to do such study properly could be justified in terms of what one might expect to accomplish by it.

We are left then with the information that certain types of injuries are seen characteristically in certain recreational sports, and that their occurence is rare, moderately frequent or quite common. From the nature of the activity concerned and from the experience of the individuals involved we can deduce the mechanisms of injury responsible and attempt to develop performance or skills which will minimize or eliminate these mechanisms. Where it is not possible to do this adequately we may try to develop protective or safety equipment. We can also establish rules and safety regulations aimed at eliminating the hazards or procedures which create these risks.

Let us consider an example of how such analysis can be applied to one recreational sport. In parachute jumping it has been found that fractures of the heel and of the spine are associated with landing flat on the feet. Parachute instructors therefore teach that the jumper should land on the fore part of the foot with knees flexed and to roll backward with the first touch so as to dissipate the landing shock gradually. Since head injuries are not uncommon in both controlled and uncontrolled parachute landings we equip the parachutist with a helmet lined with a shock-absorbent material. Finally, because severe injuries occur more frequently when landings are made at ground wind speeds of over 18 m.p.h. due to dragging of the parachute, there is a regulation that sport parachute jumps shall not be made into an area where the wind speed exceeds this mark. Actually, there are many more factors in all three categories: skill, equipment, and rules, to be considered in this sport, but these can easily be appreciated by those who are unfamiliar with all of its ramifications.

Now you must also consider the individual himself or herself from the standpoint of the personal factors which may be involved in safety. Based on what we know about the risks of any given sport such as the speed, strength, endurance, coordination or balance required, the environment in which it is practiced (air, land, water surface, underwater), whether an automotive vehicle is involved, the amount of bodily contact which may be expected with other persons or objects, or other pertinent factors, what can we say about the physical and psychological qualifications which might be required of persons performing it to insure at least moderate safety?

You may be able to enforce a licensing regulation, as for flying an aircraft, which requires a physical examination for licensure. In the majority of the recreational sports the necessity for determining all these things rests with the individual himself, since no practical control is possible. He may or may not consult a physician if he is in doubt about his ability to meet the demands of the sport, but he is almost equally likely not to if he feels the advice might go against his participation. Even if he does go so far as to seek medical advice, he is free to ignore it, and frequently does. The same responsibility rests with the individual in recreational sports to seek medical aid if he suffers an injury. Here he may be impelled by the serious nature of the injury or carried off willy-nilly for emergency care. It is surprising, however, how many persons with serious injuries suffered in recreational activities will delay seeking medical attention or fail to do so at all.

In many recreational sports the enjoyment of the activity as well as the safety of the participant may be greatly enhanced by a preliminary period of body training and conditioning. It is a commonplace observation that this precaution is largely ignored, especially by those who need it most, the young post-college age group and the middle-aged persons who enjoy the occasional physical recreational activity but have not had regular exercise of any sort for a long time.

Then, too, we must be concerned that suitable and safe facilities are provided for recreational sports. In water sports, for example, boating areas should not impinge on swimming areas. Adequate space should be available so that motorized craft do not hamper or endanger the operations of sailing craft. Water skiers should be kept out of swimming areas. Water which is excessively murky and where strong or unpredictable currents exist should be posted and patrolled as unsafe for SCUBA diving. Surfers should have separate beach areas designated for their use and these areas should be free of rocks lying just below the water surface. Areas where sharks are apt to be found should be patrolled or designated unsafe for swimming. Lifeguards should be provided at public beaches and special lifesaving equipment supplied where heavy surf is found.

A first consideration of the problems posed by accident prevention in organized sports generally might be directed towards those who supervise them. The administrator of a sports program may be a high school principal, a college athletic director, a director of a local program of Little League baseball, a community recreation supervisor, the manager of a national sports team, the president of a professional sports team or perhaps the chairman of an Olympic committee. His direct approach toward the problem of injury control is to hire coaches, trainers and physicians who understand the reasons for the occurrence of sports injuries and know how they may be prevented as well as treated.

He is immediately faced with a secondary problem of how to identify such individuals. Many persons who are engaged in coaching do not have this knowledge. The majority of high school coaches have not been trained in physical education. Unfortunately, even many of those with a degree in physical education have only a rudimentary knowledge of injury problems. Fully qualified athletic trainers probably do not greatly exceed in number the membership of the National Athletic Trainer's Association, which is less than 5,000. The number of physicians who are familiar with the factors which produce sports injuries, let alone how prevention may be achieved, is still relatively small, but is being increased rapidly by the surge of interest in post-graduate education in sports medicine. The teaching of this specialty, however, has not made significant inroads into the medical schools as yet. The administrator must then make do with whom he can find, and hope that somewhere in his team the requisite knowledge may be found. If he is wise, he will see to it that his team is able to take advantage of opportunities offered to them to increase their perhaps meager store of information.

Once the administrator has established his team and lent them support in their approach to injury control, he finds that he and they may be handicapped by the limitations imposed by the school year, the traditional season, conference regulations, lack of adequate financing, the proliferation of sports, inadequate facilities, and even more problems, all of which can be related directly or indirectly to injury control. I need only cite the difficulties in conducting a high school football program, imposed by the facts that there is inadequate time for proper conditioning of the players from the time school opens before the first game is scheduled, state and conference rules forbid early starts and participation in summer camps where the school's coaches participate, the beginnings of winter sports such as wrestling, basketball and swimming overlap the latter part of the football season, practice fields are overcrowded due to lack of space, failures of attendance at games to match increases in expenditures create a continuing crisis in the athletic department budget, *etc*. Each one of these problems has a possible solution, but it must be developed in reference to the particular situation.

We have already indicated that the coach may enter his job without formal preparation in the area of injury control. He learns from experience, from other coaches, from trainers and physicians, and from clinics or courses, *if* he attends them. He must rationalize his goals and his teaching methods with his objectives in injury control. Some techniques of play which offer promise of success may be too dangerous for the athlete. The price of winning should never be the health or welfare of an athlete. Failure to keep abreast of developments may cause neglect of safety precautions.

Coaches, athletic directors, other supervisors of athletes, and the athletes themselves maintain as a group a suspicious attitude towards other persons, and particularly physicians, who attempt to introduce factors into sports which are designed essentially to promote safety. This attitude originates partly from the considerable body of unthinking and *unintelligent* criticism which has been directed against sports over the centuries by persons who never really understood the true nature of sport and its value for both recreation and health. We still hear of campaigns to abolish certain sports, often led by persons who have never been active in any sport and whose qualifications to pass judgment are trivial at best. On the other hand, the sportsmen and their leaders often place an unjustified confidence in their ability to analyze all the pertinent facts in their sports simply because they are skilled in certain techniques. They tend to be uncritical of their own actions and to resist the expert opinion offered by someone who may have valuable special knowledge. This problem is best approached by establishing rapport between the sportsman and the expert from another field through the cultivation of mutual interest in the sport concerned based on experience, participation and knowledge of its past and current history. Coaches and athletes must be encouraged to look more critically at concepts which are purely traditional but which have no reasoned basis for acceptance.

The trainer, if one is involved, should have the professional preparation which enables him to understand the sources of injury in sports and the means of their prevention. He should share the responsibility with the coach for the training and conditioning of the individual or the team. He must coordinate his efforts closely with those of the team physician to help bring about that cooperation between coach, physician and trainer which is so important to the success of any injury control program. His knowledge of the use of protective equipment, including the use of taping and bandaging, should be superior.

Ideally the sports physician should encompass the whole range of information relating to injury control. As sports medicine comes of age as a speciality, this ideal begins to be approximated. From a practical viewpoint, the team physician may represent any level of information in this regard from the least to the best informed. He is prized chiefly for his interest in sport and athletes and his availability. It can never be possible to have a physician in attendance at every sports competition, even in the so-called contact sports. The important thing is to have the medical adviser or consultant who is available or accessible when needed and who has sufficient interest in the program to know what is needed and then even though he is not able to be in attendance as much as he or the team might wish. The physician may gain much from practical experience in the sports situation since his academic background should have already supplied him with much basic information which he can apply to this experience.

The second consideration in injury control is the athlete himself. Physical examinations, including the important laboratory tests, are a necessity for competitive sports today in order to eliminate the unfit and to identify the physical problems which may be correctable to allow safer participation. There are many practical difficulties in the way of achieving such examinations en masse on an annual basis. The availability of physicians, the cost, the time necessary and the willingness of athletes and their parents to comply with such requirements are the principal obstacles. We have probably made more gains in this area, however, than in any other area of injury prevention because of the determination of sports administrators and physicians to see that it is done within the limits to which the situation allows.

The finest athletes today are bigger, stronger and faster than their predecessors, even 20 years ago. In physical contact sports this greatly increases impact, and, therefore, the potential for injury, and more serious injury. This is a factor which we cannot control directly. One strategy which has not been exploited fully to counteract this greater potential force is teaching of techniques of avoidance. This is not always instinctive, even with the finest athletes.

The prospective athlete who is immature physically poses a threat of injury not only to himself but possibly to others. Certain physical defects may be disqualifying for some sports but not others. The athlete who has already suffered an injury and has not been completely rehabilitated may be prone to reinjury. In the younger age groups, classification by height and weight as well as by age may be important in injury prevention. The assessment of the athlete's motivation towards sport and his emotional reactions to it may also be important in injury control. The role of training and conditioning of the athlete is a very important one in injury control. In relationship to his external environment whether it be hot or cold, excessively humid, with a low barometric pressure or a high one, acclimation is essential to prevent serious illness and injury. Muscles which are inadequately conditioned may be strained or ruptured. Joints which are poorly protected by weak muscles may be disrupted. The individual's life may be endangered by a failure of strength or endurance at a critical moment. The following of poor training practices such as crash dieting and dehydration may cause serious illness and may expose the individual to injury by causing a decrease in strength and increase in reaction time.

The problems posed by the need for better training and conditioning cannot all be solved until we have more complete knowledge of what training regimens are best for each sport, more properly prepared persons to supervise these training programs, more time to carry them out, and better facilities in which they can be worked out. Motivating the athlete toward the proper and necessary amount of training and conditioning will always be a problem in some cases. As competition increases it is not always the most skillful person or team who is the most successful but the one who is best prepared. If all athletes could learn this lesson the problems of training would be much less.

Faddism, superstition and an excessive regard for traditional practices are characteristics observed among athletes. These may cause not only serious interference with proper training practices but may foster an unreasoning resistance to change. The introduction of better training practices based on physiological principles, the prescription of certain techniques of play based on the occurrence of frequent and serious injury, and the introduction of every new item of protective equipment are usually met by determined resistance from athletes, if not outright rejection. This must be expected and can be successfully combatted only by patience and firmness on the part of the sports supervisors.

The third major consideration in injury control in sports is the nature of the sport itself, including the regulations that govern it. Every sport poses some hazard of injury, even shuffleboard. In contact sports, the acceleration of the players determines to some extent the number and seriousness of injuries. In motor-driven sports, the greater the speed, the greater the likelihood of injury, and the greater the chance that any injury might be fatal. In non-contact sports where the individual is self-propelled the occurrence of injury may be related to speed if gravity is allowed to act with minimal friction encountered, as in snow skiing.

Important in each sport is the environment in which it is practiced; whether it takes place on land, on the water, under the water or in the air. Each medium poses its own particular hazards. The degree of hazard depends on the particular level involved. Thus one may go from the risks of caving several hundred feet below the surface of the earth, to the top of a mountain 26,000 feet above sea level, from the lower atmosphere of the air up to 70,000 feet to make a parachute jump, or from the surface of the water down 400 feet in sport diving. In order to recommend proper precautions, equipment and other safeguards, the sports physician must be familiar with all risks to which man may be exposed in these extremes of our earthly environment.

The objects used in games and sports from balls to rackets to boats to gliders, *etc.*, each pose particular hazards to the sportsman both in their correct and incorrect usage. These risks must be studied, analyzed and provided against as far as possible. The impact of animals, birds and other living creatures encountered in sports activity, or used as a regular part of sports participation, such as the horse, must be taken into account.

The methods of practice of sports change over the period of years, giving rise to a greater or lesser occurrence of injuries as they do so. American football has changed so much and so many times since its origin less than a hundred years ago that it is now hardly recognizable as the same game. The dangerous mass tactics of the turn of the century were abolished only to be succeeded by the hazardous practice of butt blocking and tackling. This has now been eliminated from the game by the Rules Committees of both the high school and college associations and by the designation of these techniques by the American Football Coaches Association as unethical teaching methods. The experiences of the current season will demonstrate whether or not the character of the game is substantially altered, as some have claimed that it would be, and whether the numbers of serious and fatal head and neck injuries are decreased.

Since the rules are enforced and interpreted by officials, the actions of the officials cannot be ignored as factors in injury control. A very loose application of the rules in a contact sport may lead to very violent action and many injuries. Strict enforcement may prevent many unnecessary traumas. The variables include the training and other qualifications of officials, pressures exerted by players, coaches and the spectators on the officials, and the willingness and ability of players to deceive the officials.

A fourth consideration in injury control is the use of protective equipment in sports. In contact sports such as American football and ice hockey, the use of protective equipment by the players is maximal. In soccer and rugby, however, both equally vigorous contact sports, its use is minimal. In sports such as golf and tennis there is no need for protective equipment, although the player may wear a glove by choice. Protective equipment may vary from the electrically heated suit of the sky diver to the wet suit of the SCUBA diver to the flameproof clothing of the automobile racer. It may be as simple as the wrist band of the archer or as elaborate as the new hydraulic helmet of the football player. It may be as durable as that helmet, or may be discarded after every application, as the tape which a trainer wraps on the ankle.

Protective equipment must satisfy certain requirements in order to be effective:

1. Its specifications must approach as closely as possible maximum protective requirements for the part to be protected;
2. It must be sufficiently durable to withstand repeated use without significant decrease in the protective factors;
3. It must be properly fitted so that it covers adequately and stays in place under usual conditions of use;
4. It must not be so bulky or heavy that it impairs the normal and necessary free movement of the athlete;
5. It must not create a hazard to other contestants;
6. It must be replaced when so worn that a significant amount of its protective factors are lost.

The introduction of good protective devices into sport has never been an easy matter. Both players and coaches resist the introduction of every new piece almost without exception. The history of baseball equipment from the introduction of the first glove down to the batting helmet provides an excellent series of examples. Part of this resistance is due to tradition, part to a natural desire to remain unencumbered, part to a desire to be easily recognized by the spectator, and part to the fear of being thought unmanly. We are going through a very difficult period of transition to the wearing of a helmet by the professional ice hockey player, where all these factors are operative. The helmet is mandatory in high school and college hockey and for all professionals below the National Hockey League and the World Hockey Association levels. The European national teams, which are technically amateur but are comparable in every way to the best North American professionals, all wear helmets, and are apparently no less successful for so doing. The face mask for ice hockey goalies, which was at first rejected by professionals after it was brought into the NHL by Jacques LaPlante is now used universally. The Amateur Hockey Association of the United States has this year made the wearing of face protection mandatory for all of its players as the result of the occurrence of many serious eye injuries.

Research involving the improvement of existing items of protective equipment is now proceeding at an accelerated pace, stimulated by the establishment of a Committee on Portective Equipment for Sports under the auspices of the American Society for Testing and Materials (ASTM), by the National Operating Committee on Standards for Athletic Equipment (NOCSAE), and by the threat to manufacturers implicit in the establishment and operations of the Federal Consumer Product Safety Commission.

The atmospheres in which competitive sports are played today is a fifth area of concern in injury prevention. It is said that we live in a violent society. Perhaps it has always been violent, and the character of violence has only changed with the times. Perhaps the area of sport did not reflect this violence proportionately while it was predominantly amateur before World War II. The increase in professionalism of sports since then has created situations in which aggressive and violent behavior are more apt to occur. Inevitably amateur sport has come to reflect the developments in professional sport.

The interactions between spectators and players appear to contribute many times to excesses of violent behavior on both sides. It is too facile to say that the officials lose control of a game solely as the result of their own actions or inactions. Although there is no question that we can use more and better officials in practically every sport and that it will be a long time before we begin to approximate the requisite numbers of women officials, these people are often victimized by factors which are beyond their control. Excessive consumption of alcoholic beverages by spectators is only one example.

Lack of self-discipline on the part of individual competitors in organized as well as unorganized sports practice and competition leads to actions which increase the risks of injury very substantially. Although these actions are frequently the result of carelessness and lack of concentration, at times they appear to be deliberate acts of defiance of the authority of coaches or others or to result from a need to demonstrate individuality as a means of ego satisfaction. The abuse of drugs, which can reduce the ability to protect oneself from injury also falls into this category.

What overall approaches to injury prevention in sports seem most likely to help us improve our record in view of all the considerations which we have discussed? The accumulation of better and more complete information as to how, when, why and to whom sports injuries occur seems to be a major priority. More efficient procedures for the screening and qualifications of athletes might be equally important. Better training, coaching and conditioning can certainly make substantial contributions to safety. Rule changes offer possibilities in some sports, better enforcement of existing rules in all sports and more and better qualified officials can all help. Protective devices involving both equipment and facilities can be improved by the application of modern technologies. Perhaps most of all, a greater emphasis on safety education for all persons concerned with and involved in sports could result in significant reductions of numbers of injuries in physical recreation activities of all kinds.

Outside of particular efforts which are being made by individuals and groups in particular sports to collect injury data, such as in the National Football League, for example, there are only two continuing efforts which attempt to be comprehensive in their coverage of this material. One is the Consumer Product Safety Commission (CPSC) which uses the National Electronic Injury Surveillance System (NEISS) to collect information on sports injuries which have some relation to protective equipment or products with injury potential that are used in sports. The other, which has been partially subsidized through the CPSC, is housed at Penn State University under the direction of Kenneth S. Clarke and is accumulating data from high school and college sports programs.

Since the NEISS is tied into a representative sample of hospital emergency rooms around the United States, it can only record those cases where hospital treatment on an in or outpatient basis is thought to be appropriate or necessary. The basic data which are retrieved from the computer terminals have been amplified by several special surveys covering limited types of information in a few sports. Funding is not adequate at present to extend these surveys to all sports and to study them intensively.

Dr. Clarke's study suffers from the handicaps of being entirely a volunteer activity, except for a very few persons working at its headquarters, and of depending on these volunteers in the field to mail in their questionnaires on a regular basis. It involves chiefly college experience at the present time, although efforts are being made to extend it to the coverage of high schools. Because the sample is not drawn to be representative of all areas of the country, various sizes of student bodies, and to be representative of regional variations in the practice of particular sports, only limited conclusions can be made from the results.

We do not have any solution at the moment for the problem of better qualifying examinations for athletes and better coverage. We know much better than 20 years ago what to look for and how to look for it. The difficulty is that if we do everything that we might like, it will take more time, personnel and money than we have available. We are dealing with greater numbers each year but with an actual reduction in the financing for sports at the amateur level over what we had a few years ago. It is quite apparent that if we are to do more examinations we shall have to rely more and more on paramedical personnel.

We have the knowledge of how athletes can be better conditioned to help prevent sports injuries. We have more and better qualified trainers today than ever before, but they are found chiefly in the colleges or with professional sports teams. Many of our coaches in the high schools do not know the optimum methods of training which are available to them, even without expensive equipment. Even when they do, they may be frustrated by the athletes who typically try to avoid training as much as possible, and by limitations which are imposed on the athletes by the schools which relegate it only to certain prescribed periods.

Progress in changing rules and writing new ones for safety is always slow, but it has speeded up considerably in the past few years as the result of actual and threatened suits against educational institutions and other sponsors of sports because of injuries which the plaintiffs claim might have been prevented by better rule making. The new rules governing the use of the helmeted head in football represent a significant step in attempts to reduce serious and fatal injuries in that sport. We have not made comparable progress in improving the training of officials or increasing their numbers. One of the biggest problems there is setting more realistic pay scales and securing financing to cover them.

Progress in the development of safety devices, including equipment, both personal and ancillary, has been most gratifying in the past 10 years. In some instances the technological development has outstripped our ability to motivate people to its use. The eyeguard for handball and other court games is an example. The introduction of new lightweight materials has been a very significant factor in these developments.

Education for safety in sports at all levels of participation, supervision and observation is the area in which we have experienced the greatest deficiency. One of the principal reasons that we are doing the job poorly, or not doing it at all in some cases, is that we do not have salaried positions available in all agencies or jurisdictions in which sports are conducted for persons with specific training in sports safety. If these positions could be established, more colleges and universities would set up programs to prepare persons qualified to fill them. Most of those who are currently interested in this field have to go into industrial or automotive safety because that is where the jobs are. Education and training in safety education quite logically therefore focus on these areas rather than on sports.

Just as we are discovering that the costs of medical treatment are enormous and appear virtually impossible to control, so the costs of complete medical supervision and control of sports, if we were able to attain them, and even then the present costs of what we have if we had to pay for them in full, which we don't because so much is done by volunteer efforts, would be well beyond our reach. The answer to the problem posed by trying to pay for the treatment of disease after the fact is a comprehensive program of preventive medicine. In the same way, a most important answer to the problems of preventing sports injuries and treating their results must lie in the development of a comprehensive program of safety education. Much of the information and technology needed for this job is already available. We must set ourselves to the task of applying it.

Frazier Damron — introducing Dr. Ryan and John Powell

Status Report:
The HEW Survey of
Athletic Injuries and Deaths

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University Park

Background

On August 26, 1974, President Ford signed into law PL 93-380. Section 826 of that bill charged the Secretary of Health, Education and Welfare to conduct a study of athletic injuries in schools and colleges. Specifically, the Secretary was directed to:

> ". . . to determine (1) the number of athletic injuries to, and deaths of, male and female students occurring in athletic competition between schools, in any practice session for such competition, and in any other school-related athletic activities for the twelve-month period . . . (2) the number of athletic injuries and deaths occurring . . . at each school with an athletic trainer or other medical or health professional personnel trained to prevent or treat such injuries and at each school without such personnel.

By "school" was meant essentially all secondary schools, two-year colleges, and four-year colleges/universities in the United States. The Act required the Secretary to classify and report the above findings according to the type of institution. Funds were also authorized to be appropriated to carry out these provisions.

This directive originated in a House Bill sponsored by Representative Edwin B. Forsythe (New Jersey) and was later modified by the companion Senate bill. It was considered as the preferred course of action among several recommended alternatives for congressional attention to the health supervision of sport programs in educational institutions. National sport organizations generally had agreed that a meaningful study of this nature would be helpful, and had not spoken against the legislation. The responsibility for implementing the bill's provisions was delegated to the National Center for Education Statistics (NCES).

On September 4, 1974, NCES convened a study group of staff and other individuals familiar with current national activities relevant to the bill's requirements to develop guidelines which would permit the immediate initiation of the study. The bill mandated the 12-month study period to begin 60 days after its enactment and within 50 days the schools were to be requested to maintain the necessary records to comply with the bill's requirements for data. The date of Presidential Signing was too late to use the 1974-75 school year as the study period unless records already maintained in the schools were adequate or unless retroactive data collection was reasonable.

It was readily recognized that customary data collection practices in secondary schools and colleges would not satisfy the study's requirements. The National Athletic Injury/Illness Reporting System (NAIRS), located at The Pennsylvania State University had been conceptualized earlier in 1974 with the active involvement of most of the national sport governance organizations. This system had the capability of providing the mechanism for this difficult task, but was just becoming operational on a pilot basis. The study group recommended that NCES utilize a modified version of NAIRS which, for purposes of feasibility would survey only significant injuries *i.e.*, those injuries that were more serious than a minor disorder and incidents that were limited to "athletics," defined as varsity or club sports. Under this plan a data log could have been developed quickly for distribution to participating institutions for periodic submission to NAIRS.

Subsequent to that meeting, however, further developments precluded the use of this approach:

1. The definition of "school-related athletics" was reaffirmed as including intramurals and physical education classes in addition to inter-institutional activities.
2. The sample was enlarged to include representative samples of secondary schools in each state.
3. The term "athletic injury" was redefined to include the more common occurrences as well as the severe conditions, although provision for differentiation by degree of severity remained a part of the design of the survey.

As a result of the broadened scope created by the above changes and since there was no increase in the authorized funds, the character of the study's design and the instrument had to be changed. Intramurals and physical education classes present different modes of safety supervision and injury record keeping from varsity programs. The state-by-state sampling concept dramatically increased the required sample size. Attention to minor as well as significant injuries precluded acceptance of the recall necessary for retroactive recording if mid-October was to be the beginning of the data collection period. Fewer data could be obtained, and data submission from the schools would not be feasible except for the one end-of-year report.

Consequently, NCES proceeded to: (1) reset the target date for the study period to July 1, 1975, (2) develop the instrument which would satisfy the charges of the Act within the funds authorized, (3) effect the sampling process, (4) elicit the names of the individuals who would be the school contacts in the respective sample institutions, (5) mobilize State Coordinators in order to monitor secondary school contacts, (6) develop computer programs and (7) prepare specifications for the final report.

In May, 1975, all procedural and design considerations were completed. In June, 1975, The Pennsylvania State University signed a contract with the Department of Health Education and Welfare which gave NAIRS specific tasks in order to satisfy the study's requirements. Among these duties were the enhancement of compliance through periodic communication with participating institutions and also to interpret the definitions and expectations of the survey instrument as required. In addition the survey staff at Penn State assisted NCES in conducting a mid-year review bringing together organizations with expertise in the area of the study's thrust for the development of criteria and premises for interpretation of incoming data. Finally the survey staff involved with the study was to receive and edit all incoming survey forms and provide a "clean" computer tape to NCES. The cooperation between NCES and the Penn State survey staff was reflected in the announcement which appeared in publications of the National Athletic Trainer's Association, National Federation of State High School Associations and the National Collegiate Athletic Association. The journal notices alerted members of these organizations to the reason for the survey and encouraged them to comply with the survey requests.

The Survey Year

The sampling procedure yielded a reported survey sample of 21% of U.S. secondary schools and 41.2% of U.S. two-year and four-year colleges. In June, 1975, all institutions in the sample were forwarded by NCES (through the state coordinators in some states) the *Survey Report Form* (Exhibit 1) which was to be completed and returned at the end of the study period, the optional *Survey School Worksheet* (Exhibit 2) which was to provide exposure data for the various sports offered by that institution, and the *Running Log* (Exhibit 3) which was an optional aid for recording injuries as they occurred.

By September, 1975, the survey staff at Penn State had been assembled for the purposes of the conduct of its assigned tasks and to ensure there was telephone coverage during all hours of the working day. By the end of October, all mailing lists had been received from NCES and all institutions in the sample or their state coordinator had received a followup letter from Penn State informing them of Penn State's role in the survey and soliciting any questions regarding complying with the survey's requirements. A system for logging inquiries was instituted in order to tabulate the concerns expressed to the survey staff by recorders in the field and to record the need for assistance. For example, a number of institutions indicated that the initial forms were never received. A handbook was developed for use among the survey staff to ensure accurate responses to anticipated questions. Explanations which clarified definitions and formal procedures were shared with NCES staff.

Definitions and Interpretations

The *Survey Report Form* (Exhibit 1) provided the working definitions of athletics, injuries, total number of participants, and sport categories. The following statements comprise some of the special interpretations required for they were not clear in context.

Other Health Person Immediately Available. Injuries were to be reported by severity, by sport category, by sex, and by whether "an athletic trainer or "other health person" was present or immediately available at the time of injury." The *Survey Report Form* defined the other health person as "professionally qualified to provide immediate treatment of athletic injuries." The NATA Certified or Associate Member are required to have these competencies. Relative competency aside, it was considered necessary to have objective criteria at hand for inquiries if other personnel were involved. The professional persons who met these criteria included: physicians, nurses, emergency medical technicians, and others who were currently certified in both Advanced First Aid and Emergency Care (Red Cross) and Cardio-Pulmonary Resuscitation (Red Cross or American Heart Association) and who were available to the athletic or physical education program according to some organized plan. This clarification was included in the initial communication from Penn State to participating institutions.

Death. Initially it was not clear whether a sport-related death was to be tallied among the severe injuries. The survey staff recommended that they not be so included; it posed no problem during the editing phase to verify the sport-relatedness of any death as recorded in Item 5 on the form and record a death total on the form. This procedure was accepted and the sample participants were notified in January.

Varsity squad size. Varsity squads often have a high attrition rate after early season practices begin. It was determined that the total participants to be recorded on the *Survey Report Form* would be representative of the customary squad size after the season schedule was underway. However, an athlete who received an early season injury and subsequently did not make the squad was reported as a participant and as an injury.

Major/Severe Injury. The definitions of injury used in this Survey were compatible but not identical with those used by the National Athletic Injury/Illness Reporting System (NAIRS). The HEW Study, for example, combined NAIRS' Minor (Time loss < 1 week) and Moderate (Time loss > 1 week but < 3 weeks plus dental injuries) categories as one. HEW's "Severe" category, on the other hand, coincided with NAIRS' "Major" category (> 3 weeks time loss).

Current Status

The original survey report form requested institutions to distinguish among tackle football, other contact sports, and noncontact sports in recording participation. With respect to physical education classes, this distinction was deemed impossible for most secondary school programs and many collegiate programs. As a result, NCES asked permission to modify the survey report form to characterize physical education classes as a single category, with the number of participants determined by the number of different students in an institution who had enrolled in a physical education classes. The sample was notified of this *impending* action in an initial communication from the survey staff. NCES received permission in late December and the modified forms needed for the survey were mailed in early January. Further information from the Penn State Staff regarding clarification of definitions was forwarded with these forms.

A third general mailing was sent from the survey office at Penn State in early May, 1976. This memorandum contained information reaffirming definitions, general information concerning the completion of the forms and an itemized procedure for the return of the survey forms to Penn State following the end of the survey period on June 30, 1976. Each institution in the survey received an extra copy of the report form either directly from Penn State or from their secondary school state coordinator.

As of the end of May, survey reports began to arrive at the survey office. The change in the form at midyear caused several problems with the forms that were returned early. Some institutions submitted their information on the obsolete form. This made it necessary for the survey staff to contact these individuals and attempt to separate data reported for intramurals and physical education. The frequency of the arrival of these obsolete forms prompted NCES to again mail directly to participating schools a copy of the revised form in order to encourage those who had not submitted their reports to use this modified form. This was successful in that the majority of forms received after 1 July were on the correct form.

During the editing phase of the survey, the staff found several areas of potential error, and therefore, individual recorders were contacted to clarify their reported data. This editing and verification process will continue until the completion of the survey.

Capabilities of the Survey

With caution respecting the delimitations and limitations of the survey design, this survey comprised the first study ever conducted which will provide both a state-by-state and national estimate of the relative incidence of injury and death in sport programs offered by educational institutions. The capability of distinguishing types of sports, sex of participants, and degree of severity will give important perspectives to these data. The capability of having a reasonable estimate of participants at risk is critical to any interpretation of the results. The comparability of the survey's injury definitions with those of NAIRS provides the capability for examining (e.g., in football) the relative reliability of the sample's reports on injury frequency with that of the NAIRS schools which are known to have a working mechanism for data collection.

The determination of the availability of persons competent in modern first aid, if not the more encompassing field of athletic training, will illuminate one dimension of the underlying concern for responsible health supervision of athletic programs. Finally, in terms of secondary schools, the capability of a particular state to examine *its* results as well as the national scene will provide regional baseline information for subsequent attentions.

Limitations of the Survey

Every study not only must have certain defined boundaries in its design in order to collect observations but one must be consciously aware of these boundaries when the time arrives for the interpretation of the findings. The funds authorized for this endeavor imposed profound compromises in design in order to arrive at some data interpretation capability. For example, it was found to be simpler to modify the study period to fit athletic administration realities than to fit the charges given the Secretary of HEW to the authorized funding level. Some of limitations of the study are as follows:

1. This study cannot elicit and summarize the types of injuries incurred within the various categories of sport; nor can the survey obtain circumstantial information which might indicate certain injury situations or patterns which in turn could give direction to

remedial efforts. What will be gained essentially is the time-loss significance of these occurrences and the availability of health care personnel.

2. This study's design did not permit the survey staff to know how an institution complied with the survey's demands nor how well an institution complied (nor until the study period was concluded whether an institution was even complying.)
3. This study was confined to one calendar year. Whether the findings would fluctuate from year to year, and if so, to what extent, will not be known. Thus, it will be impossible to characterize the data as either endemic or epidemic.
4. This study excluded attention to the manner in which a particular athletic program had access to medical personnel and facilities and/or services. Since the structure of this access is highly variable among communities, it will not be known whether a physician's relationship to the institution and/or athletic trainer (or "other health person") was a factor influencing the data collected.
5. This study may find higher injury rates among institutions having more qualified health supervision due to the conservative reliable reporting habits of some personnel.
6. A philosophical limitation concerns the denominator of the calculated risk equation: the benefits justifying the administration of athletic activities. Since sport and its hazards are offered to students for health and educational reasons, one must remember that these epidemiological data do not reflect the degree to which the benefits justified the risks involved. It must be noted in this regard that this design will not provide actuarials perspective in terms of injury/death incidence figures for that population from alternative activities during the study period.

The majority of the survey data collection has been completed. Final editing of incoming forms and the preparation of the "clean" data tape will be achieved this fall. The final report of the operating procedures of the survey staff along with its recommendations will be submitted to NCES as will all other appropriate material developed in the fulfillment of the contract.

Robert Kirk — Don Herrmann seated in background.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE EDUCATION DIVISION WASHINGTON, D.C. 20202 **SURVEY OF ATHLETIC INJURIES AND DEATHS (Report Form)**	FORM APPROVED O.M.B. NO. 51-374053
INSTITUTIONAL IDENTIFICATION	Please use this form to report on injuries or deaths occurring in your athletic program during the period from **July 1, 1975 to June 30, 1976.** An extra copy of the form is provided for your records. Submit the form to the coordinator (in the envelope provided) by **July 5, 1976.** If your school year is over, and all athletic activities are completed before **June 30, 1976,** submit the form then.

DEFINITIONS. The following definitions are to be used in responding to this survey:

Athletic or athletic activities are varsity, club, and intramural sports (including physical education classes) that are organized, sponsored, or approved by the school (school district) or institution of higher education for its students, male and/or female. Secondary schools should only include activities dealing with grades 10 to 12 (or 9 to 12, if your school is organized that way).

Athletic activities are to be classified in three groups:

1. Athletic competition between schools (intercollegiate and club sports)
2. Practice for athletic competition
3. Other (intramurals and physical education classes)

Sports categories include the following three groups:

1. **Tackle football**, only
2. **Other contact sports**, including baseball, basketball, boxing, field hockey, touch and other football (except tackle), ice hockey, judo, lacrosse, rodeo, rugby, soccer, softball, water polo, wrestling
3. **Noncontact sports**, including archery, badminton, bowling, crew, cross country, curling, fencing, golf, gymnastics, riflery, skiing, squash, swimming/diving, tennis, track, and volleyball.

Participants should include students enrolled in grades 10 to 12 in secondary schools (or 9 to 12, if your school is organized that way) and all students enrolled in colleges and universities.

For physical education classes, report the total number of students ever enrolled *(the unduplicated count of individuals)* during the year.

Injuries to be reported in this survey should have resulted directly from one of the above types of athletic activities. List each injury only once, in either of the following two categories.

MINOR/MODERATE INJURIES. Are those which result in the participant missing the athletic activity (whether competition, practice, or instruction) or scheduled academic activities or would have missed it (had it been scheduled) from one to twenty days following the day of onset of the injury.

SEVERE INJURIES. Are those which result in the participant missing the three or more weeks of scheduled practice or athletic or academic activities following the date of onset of the injury.

NOTE: For injuries which occur at the end of a sports season, respond on the basis of the time which the participant would have missed had the season been continuing.

With athletic trainer or other health person immediately available refers to the availability of a person professionally qualified to provide immediate treatment of athletic injuries. If not actually present on the site, the person must have been capable of attending to the stricken participant within five minutes.

1. TOTAL NUMBER OF PARTICIPANTS IN YOUR ATHLETIC AND SPORTS PROGRAM DURING THE PERIOD JULY 1, 1975 TO JUNE 30, 1976. DUPLICATE COUNTS SHOULD BE USED: COUNT EACH STUDENT ONCE FOR EACH INTER-SCHOOL COMPETITIVE SPORT IN WHICH THE STUDENT PARTICIPATES, IN THE FIRST SECTION BELOW, AND COUNT EACH STUDENT ONCE FOR EACH SPORT IN WHICH HE/SHE PARTICIPATES IN INTRAMURAL PLAY OR IN PHYSICAL EDUCATION CLASSES, IN THE SECOND SECTION

A. COMPETITIVE	NUMBER		B. INTRAMURALS	NUMBER	
	(a) MALE	(b) FEMALE		(c) MALE	(d) FEMALE
(1) TACKLE FOOTBALL ONLY			(1) TACKLE FOOTBALL ONLY		
(2) OTHER CONTACT SPORTS			(2) OTHER CONTACT SPORTS		
(3) NON-CONTACT SPORTS			(3) NON-CONTACT SPORTS		
(4) *RESERVED FOR EDUCATION DIVISION USE*			C. PHYSICAL EDUCATION CLASSES		

2. INDICATE THE PRINCIPAL PERSON RESPONSIBLE FOR PREVENTING AND TREATING ATHLETIC INJURIES AT YOUR INSTITUTION *(check the first applicable)*

A. ☐ ATHLETIC TRAINER, NATIONAL ATHLETIC TRAINERS ASSOCIATION, CERTIFIED OR ASSOCIATE MEMBER
B. ☐ ATHLETIC TRAINER, OTHER
C. ☐ COACH OR ASSISTANT COACH
D. ☐ SCHOOL NURSE
E. ☐ STUDENT ASSISTANT *(specifically trained)*
F. ☐ OTHER *(specify)*
G. ☐ NONE

PERSON COMPLETING THIS FORM

NAME	TITLE	TELEPHONE	
		AREA CODE	NUMBER

INSTITUTION *(If different from above)*

NAME	ADDRESS *(include complete mailing address, street, city, State, and ZIP code)*

OE FORM 2375-2, 11/75 REPLACES OE FORM 2375-2, 5/75, WHICH IS OBSOLETE

(continued on reverse)

3. INJURIES

ATHLETIC ACTIVITY	WITH ATHLETIC TRAINER OR OTHER HEALTH PERSON PRESENT OR IMMEDIATELY AVAILABLE AT TIME OF INJURY		WITHOUT ATHLETIC TRAINER OR OTHER HEALTH PERSON PRESENT OR IMMEDIATELY AVAILABLE AT TIME OF INJURY	
	(a) MALE	(b) FEMALE	(c) MALE	(d) FEMALE
A. ATHLETIC COMPETITION BETWEEN SCHOOLS				
(1) TACKLE FOOTBALL, MINOR/MODERATE				
(2) TACKLE FOOTBALL, SEVERE				
(3) OTHER CONTACT SPORTS, MINOR/MODERATE				
(4) OTHER CONTACT SPORTS, SEVERE				
(5) NON-CONTACT SPORTS, MINOR/MODERATE				
(6) NON-CONTACT SPORTS, SEVERE				
(7) *RESERVED FOR EDUCATION DIVISION USE*				
B. ATHLETIC PRACTICE FOR COMPETITION				
(1) TACKLE FOOTBALL, MINOR/MODERATE				
(2) TACKLE FOOTBALL, SEVERE				
(3) OTHER CONTACT SPORTS, MINOR/MODERATE				
(4) OTHER CONTACT SPORTS, SEVERE				
(5) NON-CONTACT SPORTS, MINOR/MODERATE				
(6) NON-CONTACT SPORTS, SEVERE				
(7) *RESERVED FOR EDUCATION DIVISION USE*				
C. INTRAMURALS				
(1) TACKLE FOOTBALL, MINOR/MODERATE				
(2) TACKLE FOOTBALL, SEVERE				
(3) OTHER CONTACT SPORTS, MINOR/MODERATE				
(4) OTHER CONTACT SPORTS, SEVERE				
(5) NON-CONTACT SPORTS, MINOR/MODERATE				
(6) NON-CONTACT SPORTS, SEVERE				
D. PHYSICAL EDUCATION CLASSES				
RESERVED FOR EDUCATION DIVISION USE				

4. DEATHS *(For any deaths, describe in Item 5, sport involved, sex of student, circumstances, diagnosis of cause of death, and type of health person in attendance, if any.)* *If no deaths occurred during the reporting period, enter "X" here.*→ ☐

5. COMMENTS

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
EDUCATION DIVISION

SURVEY OF ATHLETIC INJURIES AND DEATHS
SCHOOL WORKSHEET (Optional)

OMB NO. 51-574053
APPROVAL EXPIRES 12 31 76

Use of this worksheet is optional. It may be used to aid in totalling the number of male and female students participating in various kinds of athletic activities (to provide the totals requested in Item 1 of the report form). It also may be used to record injuries as they occur (to be used in developing the totals requested in Item 3 of the report form).

The worksheet, if used, need not be submitted. The only report necessary is the summary form, to be submitted at the end of the 12-month reporting period (June 30, 1976, or earlier if the school year is over and all athletic activities have ceased).

MAJOR SPORTS ACTIVITIES	NUMBER OF PARTICIPANTS		MAJOR SPORTS ACTIVITIES	NUMBER OF PARTICIPANTS	
	MALE	FEMALE		MALE	FEMALE
A TACKLE FOOTBALL TOTAL			C NON-CONTACT SPORTS ARCHERY		
B OTHER CONTACT SPORTS BASEBALL			BADMINTON		
BASKETBALL			BOWLING		
BOXING			CREW		
FIELD HOCKEY			CROSS COUNTRY		
FOOTBALL *(except tackle)*			CURLING		
ICE HOCKEY			FENCING		
JUDO			GOLF		
LACROSSE			GYMNASTICS		
RODEO			RIFLERY		
RUGBY			SKIING		
SOCCER			SQUASH		
SOFTBALL			SWIMMING DIVING		
WATER POLO			TENNIS		
WRESTLING			TRACK AND FIELD INDOOR		
OTHER *(specify)*			TRACK AND FIELD OUTDOOR		
			VOLLEYBALL		
			OTHER *(specify)*		
			NON CONTACT SPORTS - TOTAL		
OTHER CONTACT SPORTS TOTAL			D INTRAMURALS - TOTAL		
▨	▨	▨	E PHYSICAL EDUCATION CLASSES TOTAL		

OE FORM 2375-3, 5 75

FORM APPROVED O.M.B. NO. 51-S76053

RUNNING LOG OF INJURIES AND THEIR CLASSIFICATION

PAGE NUMBER

NUMBER OF PAGES

STUDENT IDENTIFICATION (*Use this column in any way desired*)	SEX OF STUDENT		TYPE OF SPORT			TYPE OF ACTIVITY				DATE OF INJURY	WAS TRAINER OR OTHER HEALTH PERSON AVAILABLE?		DATE RETURNED OR COULD HAVE RETURNED TO ATHLETIC ACTIVITY	CLASSIFICATION OF INJURY	
	M	F	FOOTBALL	OTHER CONTACT	NON-CONTACT	COMPETITION BETWEEN SCHOOLS	PRACTICE FOR COMPETITION	INTRAMURALS	PHYSICAL EDUCATION CLASSES		YES	NO		MINOR/MODERATE (*missed or would have missed at least one day's activities not including date of injury*)	SEVERE (*missed three weeks or more of activity*)

OE FORM 2375-3, 11/75 REPLACES OE FORM 2375-2, 5/75, WHICH IS OBSOLETE

Question and Answer Period

Question #1. One point brought up this morning was the lack of validity of a one-year survey. In your closing remarks, you commented on how much data had been collected and so on. You also made a very strong point of how many things had not been done, and also how much data could not be relied upon since it was just a one shot. There has been a tremendous amount of work and effort gone into this as a one shot project, and as you described through your presentation, the original concept was altered due to certain things that had to be changed time after time after time to facilitate what was necessary. My question may be rather impertinent but "what was accomplished besides getting the sponsoring Congressman's name on the record as having done something?"

Powell: I think several points have been accomplished by the program. It is the first attempt at a project of the scope that this one entails and we all learned by our efforts. It is an extremely good learning experience. And we will be able to distinguish some incidence rates by sex, for example. There will be some parts of the program that will be useful. There are things that we in the sports field would like to have seen accomplished that were not accomplished. I think the project will be beneficial as a stimulator. We will be able to see from this project what has not been done, what needs to be done and what kinds of things programs are going to have to do and follow through on in order to develop the kinds of answers that we want. I have had many comments from people saying this was a worthless study that should not have been done and that it was a waste of money. And they are entitled to their opinions. I don't feel that strongly about the fact that it was a wasted effort. I have been with it since it came to Penn State and I have worked for a year on it now and am still working toward its completion. I see it as having limitations but I also see it as having some very profound impacts on the area of injury reporting and the injury prevention field in the years to come. So I don't think it has been wasted.

Question #2. How much more could have been accomplished with a bit of cooperation toward the type of work Casey Clarke has done privately and much less expensively than when the government was involved in the program? I think a bit of assistance for his type of privately developed well thought-out process would have been worthwhile. If he could have had that much money poured into his type project, how much farther ahead would we be at this time?

Powell: There are some very obvious answers to that question. Now that we know what the NAIRS system is like and what it will do, and what its capabilities are one could make the general statement that had the government put that money into NAIRS we would be much farther down the road. However, with the scope that was finally decided upon and at the time that this project was designed, NAIRS did not have that capability. It was programmed for it and we all believed that it would at some point develop such capabilities and now it has those capabilities. But the amount of money that was available at the time the project was authorized would not support the kinds of data collection that NAIRS has now at the levels that were projected with 3500 schools and to design and develop a complete computerization system. This could not be done at that time.

Question #3. There has been a lot of controversy developing over disqualifying physical factors. For example, the athlete with one eye, the athlete with an undescended testicle, *etc*. The courts have been stepping in and putting restraining orders and temporary injunctions on letting the athlete participate. Could you comment on what you think as a team physician?

Ryan: When the AMA Committee on Medical Aspects of Sports began to prepare recommendations which it would issue to people involved in the supervision of sports programs, one of the first things they turned their attention to was the physical qualifications of athletes.

I was a member of that Committee at that time and in this respect I think I was a minority voice because the majority of the members of the Committee were very conservative physicians. As a consequence, the first series of the recommendations that they put out indicated that certain conditions were absolute barriers to participation in sports. As a result of these recommendations, many state high school athletic associations which did not have any specific requirements adopted these as requirements *in toto* and made them mandatory. Wisconsin was one state where these requirements were put into effect by the School Safety Commission. As a result, there was much controversy as the speakers have pointed out, with regard to the administration of these rules. Many athletes probably were barred from competition who should not have been. There was constant agitation between the parents, the athletes, the schools. Roberts of the Wisconsin Interscholastic Athletic Association told us finally that if some changes weren't made in these rules, that he would have to double the size of his office staff just to handle complaints which were coming in with regard to them. And so the Committee on School Health, of the Wisconsin State Medical Association discussed the situation, reviewed it and I think, fortunately, decided that the restrictions which had been made mandatory were much too restrictive and that there should be a greater opportunity for individual judgment made in these cases. And as a result, we changed our state high school rules and Don Herrmann who is here now and who represents the WIAA, I think could vouch for the fact that since the rules have been changed, the complaints have gone down to virtually nothing, isn't that right Don? "Yes."

Now what we did was state that these things which had previously been mandatory requirements for elimination from sports are things that the parent, the athlete, the coach and the physician must regard as serious problems. But the resolution of the problem whether the athlete will participate or not, must come about as a result of the meeting of minds of the people who are involved. The physician is allowed discretion with regard to his recommendation. Even if the physician feels that his recommendation might be for the athlete not to participate in the particular sport, if after a conference with the parents, the athlete, perhaps the coach involved, and so forth, everyone is fully informed as to the possible dangers which may be encountered then, if it is still the desire of the parent of the athlete that this athlete should participate, then the athlete will participate.

We heard some dire predictions as to what would happen with regard to this change in ruling, but I don't think we've seen any unfortunate effects from this as yet. Our injury ratio in Wisconsin did not increase, we didn't have fatalities, we didn't have people going blind, we didn't have people dying from renal failure because one kidney (their only kidney) was damaged and so on. So I think our experience with this shows that these original recommendations were too conservative and they were not thoroughly considered in terms of what the impact on the whole population would be.

In some states, they still have these very rigid restrictions. I have been getting inquiries, I would say at the rate of about 2 per month, from physicians, school administrators, and so on, from other states, asking what are we going to do about these regulations? I answer all inquiries the same way by explaining to them what we did in Wisconsin and tell them that our experience showed that if you use these recommendations as guidelines and not as mandatory laws, you can live with the situation and that you won't have problems with it and that is all I can say. Many states still have not taken action to change their guidelines and I think they should.

Round Table Discussion
Education and Supervision for Safety in Sports

Moderators: C. Everett Marcum,
West Virginia University, Morgantown
and
C. Frazier Damron, *University of Wisconsin, Madison*

The content of major presentations at the Conference were felt to have been so overly concentrated upon injury identification, classification, emergency care, and rehabilitation that preventive aspects were almost completely forgotten. Hopefully, persons engaged in the daily practice of athletic coaching and administration would not be so remiss and fail to emphasize before-the-fact procedures to help assure prevention and mitigation of athletic injury losses.

Sport situations are usually felt to provide such a wide range of changing scenes that incorporation of safe performance as part of skills demanded for each of the different tasks selected may be extremely difficult. Coaches and other kinds of activity directors have already adopted the techniques of motion analysis, however, but have failed to include safeness or safe performance in their plans for achieving productivity. Perhaps, a suitable philsophical background regarding the need for safeness, safe performance, and safety programming has not been incorporated into the preparation of coaching personnel and even athletic directors. Fulfillment of duties that involve practice and game activities, equipment and facilities, contest scheduling and management, business and financial matters, and community and school relations may be overshadowing the need to give emphasis to safety related issues. Priorities are always important to any organization. Yet, whatever progress that has been accomplished to date regarding safety matters seems to be focused, primarily, upon after-the-fact emphases mentioned earlier rather than establishing adequate athletic injury countermeasures.

There seems to be only minimal leadership among athletic coaching and administrative personnel that is aimed at avoidance of injurious losses. Virtually any effort, in fact, is usually directed at environmental facilities and equipment items. However, 100 percent success in such efforts can, usually, result in only about 5 to 15 percent reduction in our overall injury losses. Furthermore, injury record keeping and analysis activities will always be after-the-fact activities. What about the need for before-the-fact emphases upon injury avoidance? Should we not stress more suitable and productive measures such as analysis of tasks, behavior modification, tips on safe performance, elimination of risks, and improved surveillance of activities through the medium of better supervision?

Coaches may not be aware of the overloads that they are subjecting upon athletes because of failure to fully understand safe performance applications of biomechanics, physiology, and behavioral psychology. Injury prevention and avoidance measures must be built into the sport performance task. This may require new conditioning techniques and modification of training strategies. There does not seem to be sufficient participation by safety specialists in the preparation of athletic coaches and athletic director personnel, however. Often, safety related courses are completely lacking in such preparation. In fact, safety specialists are seldom included in the planning and offering of these preparatory programs and these persons frequently find that their suggestions are rejected as being detrimental to "winning" performance by the athlete. Athletic trainers, who usually perform after-the-fact functions, seldom have adequate background in safety related subjects. Thus, severe preparatory discrepancies seem to exist among the entire "team" of athletic related specialists.

Entrenched ideas held by coaches may be so difficult to change that incorporation of safeness into improved supervision of athletic performers may be delayed for many years. Discussions of problems involving undesirable losses being sustained may be permitted, at times, but such subjects are usually shelved or delayed for additional study. It is very difficult, apparently, to get sports personnel to accept safety as a plan for achieving curtailment of errors and substandard performances plus mitigation of harmful agent contacts and, therefore, an appropriate means of minimizing a variety of losses. Actually, decreasing mistakes should be recognizable as valuable and desirable. Record setting pole vaulters achieve their objectives by perfecting performances rather than taking chances or risks that might, logically, result in permanent disability. Perfect performances are achieved, in part, by advanced planning, analysis of tasks, improving conditioning and training standards, elimination of hazards, and compensating for potentially injurious contacts. Thus, safe performances are also achieved. The average supervisory person, however, may not look upon these things as being relevant to safety. Rather, their interpretations are likely to include only the minimal components of injury sustainment, first aid, and rehabilitative procedures. Preventive measures are considered, too frequently, only after a large number of injuries have occurred, and adequate before-the-fact focus upon safety related problems remains grossly lacking.

Who should be responsible for solutions to safety related problems? How can these responsibilities be effectively interpreted for athletic coaches and directors in a manner that they will be motivated to accept them? Since the need to maintain safeness and safe performance cuts across all activities of schools, colleges, and comparable organizations that might sponsor athletics, each person who serves in a supervisory role must accept their safety collateral duties more seriously. We are often remiss for not studying the "near misses" with greater interest, because the same undesirable patterns of performance are revealed and can be used to help formulate improved injury avoidance measures.

State supervisory personnel and college and university safety specialists, particularly, must provide more in-service developmental opportunities. Actually, it might be found that athletic coaching and director personnel would be highly interested. That which appears in the literature, alone, may not be sufficient. Rules and regulations, especially, have seldom become the basis for safe performance patterns. Safety specialists must be willing to go further in working with both physical education and coaching personnel to help assure that their preparation, whether pre-service or in-service, is dramatically improved. One myth which exists, of course, is that an emphasis upon safeness, safe performance, and safety programming is already being included in certain core courses of most preparatory curricula for these individuals. Such is not, really, the case.

Schools and colleges are still reluctant to employ safety coordinators. Therefore, the presence of safety specialists in most school settings would be unlikely. Perhaps, a critical approach that might be used effectively would be to actually inform the American citizenry of the devastating effects that sport injuries are wreaking upon the youth of our country. Dr. Fred Allman, the Conference "keynoter," suggested that two large problems were facing the "sport safety movement." First, an appropriate organization has yet accepted major responsibilities for leadership of the movement and, secondly, sport injury losses are becoming so great that costs of rehabilitation activities alone are greater than the funds available. We no longer are able to completely cover up our mistakes that lead to these costs. Apparently, our safety related problems are already out of control.

Physical educators may be more aware of the need to emphasize safeness and to promote safe performance in activities that they supervise than athletic coaching personnel. Since the former are not motivated, basically, by "winning," since they do not have to make their activities self-supporting from a financial standpoint, and since they must meet specific certification requirements, these individuals seem more likely to have both professional and avocational interests in some form of safety programming. Perhaps, the certification of coaches by our various State Departments of Education would be a logical beginning, providing that a portion of the requirement incorporated a suitable component that dealt with safety.

Finally, proposed as one means of achieving a much lower number of sport related injuries was the following list of "supervisory procedures for curtailing substandard performance injuries." Rather specific efforts may be initiated to curtail substandard performance. These may be somewhat universally applied, regardless of task. Examples are:

1. Analyze each task to be performed in order that essential cognitive, affective, and psychomotor behaviors are revealed regarding (a) basic segments or preferred steps, (b) risks which require compensatory adjustment to avoid harmful contacts, and (c) human and machine factors known or suspected as being possible sources of error.
2. Formulate descriptive standards, regarding performance of basic segments or preferred steps of each task, which suggest behavioral actions that should assure compensation for risks and avoidance of errors without adversely affecting the productivity desired.
3. Train and educate personnel to perform steps of each desired or required task in accordance with the descriptive standards formulated and the accepted principles and techniques of instruction and learning.
4. Provide supervision which includes (a) regular checks upon the extent that tasks are being performed as suggested, (b) motivation of personnel involved to follow the prescribed standards, and (c) assistance for individuals who experience difficulty with compliance efforts expected.
5. Base evaluations, and follow-up corrective measures, upon success achieved in performing tasks in the productive manner desired as well as within the parameters of the descriptive standards prescribed.

Obviously, these procedures are applicable, with only minor adaptations, to the essential tasks that must be performed in relation to virtually any activity.

The National Electronic Injury Surveillance System (NEISS)

Robert D. Verhalen
Consumer Product Safety Commission
Washington, D.C.

The National Electronic Injury Surveillance System (NEISS) was designed to come up with an acronym close enough to its immediate predecessor system so that all of the people who have been using national data would be able to recognize it. There had been a system known as NISS, the National Injury Surveillance System, but when we came up with NEISS we decided to pronounce it as you would in "*edelweiss*" for a couple of reasons:

1. It made it distinctly different from the NISS system.
2. It was truly one of the nicest things that had happened in data gathering in a long time.

Now several of you perhaps may have heard of NEISS but if I could just begin by asking for a show of hands from anybody who knows anything about the NEISS, how it operates or what it consists of. This is a fairly well informed group. For those of you who are reasonably familiar with NEISS, you may find many of the things I say not very enlightening. There are enough of you who are unfamiliar with it that I will outline the system fairly quickly to describe precisely what the system is. Well, let's call it Genesis, Exodus and Leviticus. Where it came from, where it is now and where it is going.

The NEISS is essentially a network of 119 statistically selected hospitals, which report on all injuries treated in their hospital emergency rooms and represents the 48 contiguous states. That is, all except Alaska and Hawaii. The reason these two states are omitted is by no means political; it's purely logistical. In addressing the problems of collecting data on injuries, as you all know, most injuries are not anything that could be construed as requiring a legal commitment to reporting. The need to collect data, however, is urgent and the attempts that had been made prior to the establishment of the National Electronic Injury Surveillance System were of necessity usually limited to very small geographic areas. This is for the simple reason that you always have to start any data collection effort with getting together with the organizations, or associations which represent the people from whom you are trying to collect data. You must get their endorsement and then go on down the line until you are finally dealing with the groups who are going to provide you with the data. There had been no successful attempts to get through to the hospital administrators on a nation-wide level prior to this time. There had been some attempts and there had been very short-lived programs, but the only reason they were able to be sold was because they were short-lived. The predecessor system to the NEISS which I alluded to, the NISS, was indeed a national system. There were 130 hospitals nationwide reporting to the Food and Drug Administration. However, there had been no attempt to make it statistically valid. It was purely a volunteer reporting system. Now, this is not all together bad because there is a certain amount of face validity that accompanies any data that comes to you from a widely dispersed system. But it is very difficult to really interpret what you have got.

With the NISS system, for example, out of the 130 hospitals that were reporting to the Food and Drug Administration, some 42 of them were in North Dakota I believe. I think there was one in New York State and if you try to project from any data coming from those hospitals to the nation, you can see what this is going to do. Particularly, if you have a wide scope of injury interests.

The Consumer Product Safety Commission has among its many interests, sports. But we regulate an estimated 10,000-odd products. As a consequence, the system that we were to develop would have to be much more representative than any other system had been previous to that time because of the high level of interest and visibility of sports injuries and the fact that many of what we could call consumer products, are used in playing sports. We also were required to try to do something about gathering some injury data on sports accidents. This we found to be a far more difficult job than we had originally anticipated. Sport injuries just do not happen the same way as they do in your home.

The 119 hospitals in the NEISS System each have a trained admitting room clerk in the hospital emergency room who probes the victim as he comes in for treatment, for some indication of the product associated with his injury. I use the term "associated" advisedly here because we have no notion on whether the product was causally implicated in the production of the injury or just associated with the injury.

For example, if a child falls off his bicycle and hits his head on a curb. It is clearly not the bicycle that caused the injury. It may not have even caused the accident, but it was certainly implicated in the accident.

The hospital room admitting clerk makes a concerted attempt to get the victim to identify a product or series of products which were associated with his injury. Each day, another person in the hospital (usually it's a different person, but occasionally it will be the same person, who took down the information) will screen all the emergency room records for that particular hospital on that day. They codify information for those injuries which do involve products of concern to the Commission. They put this information on a closed teletype network which will be transmitted later at high speed to Washington. This occurs five times per week, Monday through Friday evenings; weekend data comes in to us on Monday.

When the data arrive in Washington, they are spilled out of the computer each morning. One of the divisions of the Bureau of Epidemiology screens the 1200 to 1600 cases that come each day and decides which, among those for that day, will be subjected to an in-depth investigation. The reason we conduct in-depth investigations on some of these, is precisely because of what I just said about the fact that we have no notion as to causation once we get the surveillance data. Only by in-depth investigation of an event, can we begin to determine what the etiological elements are leading up to that injury. In-depth investigations are far more expensive than the original surveillance data. Since we are talking about a tax-supported system, I can tell you that the cases received (about 430,000 last year) cost you, as taxpayers, a little over $2,000,000 for the entire system, including in-depth investigations. Of the 430,000 cases reported in a 12-month period, about 7,000 cases were investigated in-depth.

The average cost per reported case was something over $.70 from the hospitals. The average cost of an in-depth investigation was around $175, a substantial differential in cost. Clearly we cannot investigate all of these cases just for the sheer economics of the situation, but it would also be a logistical impossibility.

As cases are investigated and intelligence is built upon any particular product of interest, be it pacifiers, refrigerators, football helmets, snowmobiles, hockey sticks, or whatever, we develop a hazard analysis based upon the surveillance data from the NEISS system, the in-depth investigations, plus all other data that have come to our attention. More recently, we have begun to receive some information from NAIRS. I think we have an initial report. We will be getting more. In any event, these data will also be woven into the analytical reports of the Commission. The data that are gathered from the NEISS as a matter of routine surveillance are fairly limited. We collect information on the product involved; that is, specifically what generic class of product it is, the treatment date, the age and sex of the victim, the principal type of injury; that is, given very often that the accident victim suffers multiple injuries which is the single most serious injury and what kind of injury it is. Is it a laceration, fracture, contusion, or what? Also the body part thus principally injured and where the accident occurred. This is our only way to get at sports injuries, because when we are talking about looking at sports injuries, we have obviously got two major categories. There could be other discrete categories, but we have got both organized and unorganized or sand lot sports.

We have an interest in both because sometimes equipment is used in sand lot games. But we discriminate between organized sports and the unorganized sports activities generally on the basis of location. Obviously, if the injury occurred at home, it's not organized, if it occurred at a public place, it might be. And that is about as far as we can go there. Based on a telephone interview with the victim, we can usually determine precisely where it occurred and whether or not it involved organized sports. Then, finally, we get information on the disposition of the case. Whether the individual was treated and released, whether he was treated and hospitalized, or whether he was dead on arrival, and so forth.

We do not normally pick up fatal injuries through the NEISS, however, because of the way the system operates. Unless someone is either dead on arrival or dies while he is in the emergency room, we either do not get them at all, or we get them as a serious injury, but not a fatal injury. When the data are taken at a point in time, we have that patient's disposition at that point in time, in point of fact, most fatal injuries are fatal beyond the point of which people are treated in the hospital emergency room. As a consequence, they pass through the emergency room, and are listed as a serious injury. If they die two to twelve hours later, we do not know about that. Obviously, those who are dead on the scene and are pronounced dead on the scene, very often don't even get to a hospital, so we never hear about those cases at all, except through another system which we have set up which is very similar to the system used by the National Center for Health Statistics.

We have contracts with all 54 health jurisdictions to provide us with death certificates for some 150 selected ICDA codes. Through this mechanism and press reports and the like, we tend to get much additional information, particularly in the area of sports. Most of our sports fatalities have come to us through either the press or through the death certificate system. We have no consistent reporting network for that.

The NAIRS system, however, which you will be hearing more about has much greater potential in this regard. But Dr. Clarke will be talking about that system later and its strengths and weaknesses.

One of the principal difficulties we have when we are tryin[illegible] collect information through the NEISS system as it relates to sports injuries is the fact that often when we get injuries reported to us, there is no indication as to whether or not a product *per se* was involved. If a youngster is playing football, baseball, basketball, field hockey or whatever, and is injured, he is brought to a hospital emergency room. The admitting room clerk asks a few pertinent questions and finds out that it was football, and so the injury comes coded to us as football.

Now, by the definition of the way that most of the data come to us, this would suggest to us that *the* football was associated with *the* injury. If you make the quantum leap that people want to make, people would declare that footballs, *per se*, are hazardous. We do not really look at sports injuries that way. We see sports injuries as they emanate from the NEISS system as primarily activity-related for two principal reasons. First, it is very difficult, if not impossible, at emergency room level to consistently get information as to what specific product or piece of protective equipment may have been involved in the injury. Secondly, the same kind of logistical problems exist that we have with collecting injuries in the first place. That is, there are such a myriad of different types of sports protective equipment used in different ways, in different areas, that we would have to considerably expand our coding manual and then do an awful lot of training in the hospitals to get the coders and transmitters to be able to effectively translate this information from what is reported to them to us in such a manner that we could develop a basic picture of what is happening.

I guess that pretty well outlines the NEISS, a few of its primary strengths and some of its weaknesses. But I would like to point out in conclusion a couple of the differences between the NEISS and some of the other systems that do exist.

The NEISS accepts any trauma treated in a hospital emergency room. That makes it by definition, emergency room treated injuries from any cause. Ninety-seven percent of all patients emanating from or going to hospitals do receive some degree of treatment in the emergency room, even it it is only first-aid treatment. As a consequence, we have a relatively good picture of what is occurring in the emergency room. But this injury definition provides no retrospective or prospective characteristics. There is no way for us to have any idea of what the long-term chronic effects of any type of injury may be. There is no attempt, no possible way at this point in time, to follow up these injuries or develop a long-term prospective cohort, which would permit us to determine the cumulative effects of minor insult. By the same token, there is also no way since we are using point incidence data, to look at the injuries, retrospectively. If someone comes in and we find on the basis of in-depth investigation that the individual has suffered previous similar injuries, there is no way for us to really relate it to the current injury even though it may be at the precise same location to previous injuries. Very often these injuries will have occurred 2 to 10 years before and there is no way for us to determine what any intervening variables may have been which would have mitigated or aggravated the situation.

We cooperate with most of the governing bodies of sports but our efforts are not geared to individuals or specific sports. As stated earlier, we collect information on all injuries going into the hospital emergency room. When we do try to "zero in" on a specific sport, we generally find ourselves having to do this of necessity during the season. We start receiving football injuries, for instance, in the spring with spring training but they don't begin to reach their peak until November. The logistical system of the Consumer Product Safety Commission is such that we cannot investigate injuries in football accidents during the spring. The priorities of the Commission are such that we're generally looking at things like fireworks and other kinds of injuries that are related to products that are particularly in our jurisdiction and have a very high level of interest to the Commission. With very limited resources we are stretched too thin to do the kinds of investigations that we should be doing. That is why I look forward to systems like NAIRS as a harbinger of something that will perhaps jointly work together with us and will lead us to some answers to many of the questions that are facing us with regard to sports hazards.

We use standard demographic age groups rather than trying to approximate a level of competition according to age. We adopt an age grouping which is consistent with the National Center for Health Statistics purely for purposes of statistical convenience. This is because most of the products with which we deal, are involved with injuries across all age groups. This is contrary to what we've seen in sports injuries. As a consequence of this, sports injuries are not treated separately and it requires substantial additional effort using resources we don't currently have, in order to cull these out separately and break them down by age groups which would be more meaningful to sports safety professionals.

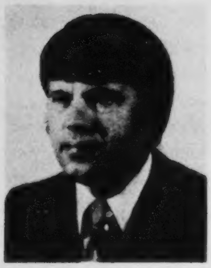
Our definition of injury does *not* address itself to whether or not individuals miss games, nor the practical aspects of injury definition that are often used by sports safety professionals, because we are dealing only with whether or not they received treatment. As I understand the NAIRS system, if an individual doesn't miss any practices or a game, it doesn't matter if he has been treated. It is not considered an injury because he didn't miss his succeeding practice or games. In our case it would be an injury. On the other hand, if the individual was not treated by a medical professional within the medical care delivery system, we would treat it as no injury even though the individual may by direction of his coach have been forced to miss the next three practices and two games. He would, normally in sports injury medicine, have had that classified as an accident.

I think that pretty well displays for the NEISS system, some of its limitations and some of its differences from other systems that exist or that are developing. I think that you can see possibly some of its limitations in terms of what your own interests might be. But I hope by virtue of the fact that we're dealing with a total universe of injuries treated in hospital emergency rooms which represents over a third of all injuries coming to medical attention, that you'll see that there is potential here for defining or indexing cases for subsequent follow-up. Precisely how these cases can be used to get at the questions of chronic injury or get at the questions of injury as they relate to specific pieces of sports equipment, we don't know. However, your own fertile minds may lead to suggestions to the Commission as to how we can better use these data.

The data are routinely made available to any of you free of charge through the U.S. Consumer Product Safety Commission's National Injury Information Clearing House. I think most of you have the address or it can be made available to you. If you are interested in the data that we have on any sets of sports activities, write to us. We'll be glad to send this surveillance data plus all the investigational data we have related to your inquiry. We would welcome any suggestions that you have for ways in which we might modify either the initial collection of data or the investigation of cases. Very often when we cannot find additional resources to do the work that you might suggest, we can certainly find ways to redirect some of the resources we have already applied to this program.

Everett Marcum with Herb Appenzeller seated in the foreground.

The National Athletic Injury/Illness Reporting System (NAIRS)



Kenneth S. Clarke, and Sayers J. Miller, Jr.
The Pennsylvania State University
University Park

Millions of boys and girls, men and women, are participating in a variety of sports to obtain the assorted benefits associated with participation and training for participation. In doing so, they are accepting a reasonable risk of injury and assuming that those who govern and assist sport programs are using professionally defensible methods for keeping the risks reasonable.

Practitioners, program directors, and rules committees with such responsibilities, however, face many decisions concerning sports health and safety problems with conflicting recommendations and without data to verify or refute respective contentions. During the Winter of 1972-73, both the National Academy of Sciences' Workshop on Injuries of Adolescents in Sports and Recreation and the AAPHER's First National Congress on Sports Safety affirmed that available sports injury data essentially were incomplete, obsolete, or uninterpretable. Studies were confined either to short-term investigations (usually one season), to a particular sport (usually football), to a particular area (usually no larger than one state), and/or to a particular injury (usually the sprained knee).

This state of affairs existed because sports injuries and illnesses are not as readily adaptable to routine national reporting as other medical problems:

1. They stem from an environment in which injury is expected and tolerated.
2. The athlete challenges the injury and the persons who evaluate and treat it because of the profound motivation to perform.
3. The "health care system" for handling the athlete's injury is organized differently than for traffic, industrial, or home injuries.
4. The criteria for evaluating an athletic injury are related more to performance disability (time loss from competition) than to type of medical care (e.g., hospitalization, surgery).
5. Formally trained medical records personnel are basic to hospitals and industry but not to sport.

These factors make it difficult for decision makers to be aware of normative data, prevailing factors, the influence of particular changes in the sport or injury patterns, trends, or the significance of a publicized occurrence or isolated study. They are stuck with opinion. Anyone's opinion.

Despite the aforementioned problems, courts and legislatures are calling for evidence of institutional accountability for the protection of the athlete from undue risk. The Occupational Safety and Health Act (OSHA), which has been functioning in industry since 1971, is edging toward the sports arena with its codes, inspections, and compliances. More recently, the Consumer Product Safety Commission (CPSC) entered this arena via its National Electronic Injury Surveillance System (NEISS). Further, federal legislation has led to a national survey by

HEW as an expression of public concern for athletic safety. Finally, high award litigation on behalf of stricken athletes is on the brink of establishing precedent for what constitutes negligence in this setting.

The efficacy of applying OSHA's procedures and criteria to the athletic setting has been seriously questioned. While CPSC has revealed its potential for serving the public's safety interests, the imaginative design of National Electronic Injury Surveillance System is appropriate to the sports scene as an investigative mechanism in principle but not in access and capability. The federally mandated HEW study in 1975-76 of athletic, intramural, and physical education injuries in schools and colleges, now completed, will yield little decision-oriented information because of its design constraints. As for litigation, on October 11, 1976, we received our first documentation that by using its NAIRS data, a college was able to stem an unwarranted suit against that institution for an injury experienced by one of its athletes.

Phase I (Conceptualization)

Early in January, 1974, a small group of individuals who collectively reflected the interests of national sports and sports medicine organizations affected by the preceding legislative and legal activity were convened at a meeting, supported in part by The Pennsylvania State University and in part by the organizations represented, to discuss the potential merit of a conceptualized National Athletic Injury/Illness Reporting System (NAIRS). The essentials of the plan had been shared with the Executive Director of the National Athletic Trainer's Association earlier in the year. Inherent in this approach was sensitivity to the preface of the Joint Commission on Competitive Safeguards and Medical Aspects of Sports' National Football Injury Report — 1970:

> "The data from the Fall of 1969 was considered preliminary and developmental and therefore was not published. . . . The changes in the reporting formats and an apparent lack of reliable definitions in 1970 . . . have diluted the potential value of the present report.
>
> Also contributing to this dilemma has been an apparent fractionating of purposes and goals among those who compiled the form, and those who analyzed it. An unfortunate end result has been a mass of data with no one person or agency continuously responsible for the resulting report."

The outcome of the meeting at which this report was officially received, was that the group agreed to serve as an Advisory Committee to NAIRS which would be housed at Penn State University until fully operational on a national basis. On the next day, the NCAA Committee on Competitive Safeguards and Medical Aspects of Sports voted to ensure continued progress by awarding a research grant to The Pennsylvania State University covering the expenses of a second Advisory Committee meeting. Later in the day, the Joint Commission on Competitive Safeguards and Medical Aspects of Sports discontinued its impending committee activity along similar lines in favor of this plan.

Later in January, consequently, the NAIRS Advisory Committee reconvened to assist in refining the details of the plan and the developmental steps toward its operational readiness. Consensus was reached on all essential considerations and encouragement was given to the Project Director (the principal author) to pursue the funds necessary to bring the system and pilot year into operation. Needed in this regard were funds for:

1. Systems analysis and ensuing computer programming to accomodate NAIRS' principles efficiently.
2. Codes of characteristics to be recorded on institutions, athletes, selected sports, and medical terminology which would be appropriate for various interests.
3. Forms, with instructional guidebooks, consistent with the data processing requirements, codes, context of the recorders.
4. Work conference for Advisory Committee and invited consultants to review the prototype system and materials.

5. Certified athletic trainers willing and oriented to serve as NAIRS cluster coordinators for institutions willing to participate.
6. Staff to operate NAIRS at its central location.

Funds to achieve these goals were slow in coming and insufficient to develop operational capability prior to use. Nonetheless, with patience and faith demonstrated by many, NAIRS has emerged faithful to the premises established at the initial Advisory Committee meetings and with data in the bank.

Premises Underlying NAIRS

NAIRS is a surveillance system for collecting meaningful athletic injury/illness data continuously in a nationally uniform manner. Surveillance, as in detective and spy stories, constitutes tailing the behavior and associations of a respected culprit. It is a mechanism for obtaining information on such events as they occur. The analogy can go further in that surveillance is not in-depth investigation, but is utilized to see when and with what focus an in-depth investigation is justified.

NAIRS is designed to be as much a service to institutions, with versatile capability and low-cost operations, as a research tool. Coded forms call for descriptive detail on whatever illness or injury keep an athlete from participating in sport. All forms, codes, and statistical analyses are oriented toward the decision tasks in sport and the constraints of scientific inquiry. It is not enough to know the frequency of knee injuries or the relative frequency of different kinds of injuries. Decision makers need to know patterns of circumstances at the time of injury and the actual effects of a particular course of remedial action. They also need to be protected from unsubstantiated conclusions and from poor or incomplete data.

Athletic injury experiences notoriously vary from year to year in a given school as well as between schools. One year's findings do not constitute a base-line. Further, since sport constantly changes, any study is obsolete within a year or two after its completion. Only when "trend-lines" or patterns are established through continuous surveillance can it be learned whether a particular experience lies within a normal range of variation or demonstrates a shift in frequency. For this information, NAIRS analysis distinguishes the potentially significant minor injury or illness (the athlete is back within a week) from the demonstrated significant case (athlete is out more than one week), and from the severe case (the athlete sustained a permanently disabling injury of significance, such as paraplegia). For perspective, NAIRS can also classify significance by actual days out, medical management (surgery, bed rest, etc.) and action taken (hospitalization, etc.).

Phase II (Early Experience)

A variety of organized sports, male and female, school and college, have been followed by NAIRS since Fall 1974 on a developmental basis. Specific inquiries into spinal cord injuries, spring football practice, and artificial surface have been conducted and completed as well. The same set of NAIRS forms is used for all sports, enabling a school to shift from one sport to another with logical and logistical convenience. A Recorder Handbook with instructions and the respective codes for each sport is given to each participating school. By a series of pre-coded forms, NAIRS-I connects within the computer many potential factors of influence in its search for patterns of injury and patterns affecting a type of injury. Injury rates can be expressed epidemiologically using squad size, number of games, number of practices, substitute-starter-or-regular, age-height-weight, etc. Rates can further be expressed by proportion of athletes using a particular product, playing a particular position, engaged in a particular activity, playing on a particular surface etc. School size, coach characteristics, and other descriptive information also can be utilized for examining related contentions.

NAIRS-I is the designation given to the prototype system in operation. NAIRS-II, an abridged version of NAIRS-I, is for schools that are without the assistance of an athletic trainer and/or for sports which have little product-safety relatedness. NAIRS-II asks fewer questions but uses the same codes as NAIRS-I. NAIRS-III is the designation for modifications to suit a particular situation (*e.g.*, pro football). NAIRS-IV (total school coverage) and NAIRS-V (clinic setting are being readied for use.

Data Reports, Confidentiality, and Costs

With NAIRS-I, the information desired is distributed over several occasions. Data on the administration of the sport and the characteristics of the athletes is collected *once* a season and computerized. At the end of each week, throughout the season, all reports of injuries incurred are submitted to NAIRS with a weekly transmittal sheet identifying information on number of games, practices, and average squad size that week. The respective identification numbers previously given the institution, sport, and athlete connect all the associated factors within the computer, not on each injury form. Not only does this ease the burden on the recorder, it avoids the research problem of relying on post-season memory and provides mid-season awareness of injury patterns. NAIRS-II constitutes a log of injuries kept during the season and submitted at the end of the season. Any conscientious student associated with the institution's varsity program can handle either NAIRS-I or NAIRS-II procedures under the supervision of an athletic trainer or physician with a minimum of orientation. The forms and their codes are designed to make the work as painless as possible yet yield information which must be in hand to be used for decision purposes.

NAIRS-I is designed to return periodic reports to each participating school: (a) monthly reports which display inventory information of its experiences to date; and (b) case reports which display each athlete-patient's record for the files and for a reliability check; and (c) *ad hoc* reports on matters of episodic interest (e.g., artificial surface relationships). The monthly reports include for reference and perspective the average experience of all schools combined (of its type) as well as that particular school's experience.

Phase III (From Capability to Increased Data Base)

NAIRS is now fully operational as a prototype system. Rules committees and qualified investigators as well as participating schools are now able to obtain current data of relevance within days of the inquiry.

At no time are the experiences of a particular school released to another. Further, at no time does NAIRS know the identity of any athlete in the system. Each school is given a log sheet for giving each athlete a NAIRS code number; only the code number is forwarded if that athlete is injured.

Until experiences are stabilized and a thorough systems analysis of the data processing design are completed, operating costs cannot yet be determined. Operational cost is affected by the number of schools participating plus the annual degree of success in locating supportive funds; however, a school year's subscription to the service should be no more than $50 for all the male sports and $50 for all the female sports the school wishes to cover. NAIRS is designed for continuity through versatility and frugality. Further, it is a non-profit activity with capabilities for receiving supporting grants.

Why NAIRS?

Recording data faithfully on any form is work. Such work must be justified, delegated, supervised, and research-worthy. Anticipating all the potential areas of interest requires assimilation of data concerning a variety of potentially interdependent factors. Traditional univariate analyses of end-of-season recall must yield to multivariate analyses of a continuous flow of cases.

NAIRS really is of three natures — functional codes, computerized system, and resource for inexpensive adaptation to customized needs. It is hoped that institutions will avail themselves of whichever nature of NAIRS fills their need. Unfortunately, it is customary for some to believe that its experiences are representative of others'. Preliminary analyses of NAIRS data to date already refute that assumption.

Acknowledgments

Funds to support the development of NAIRS have been received to date from the National Collegiate Athletic Association, National Federation of State High School Associations, National Sporting Goods Association, Schutt Manufacturing Company, Amateur Hockey Association of the United States, Sporting Goods Manufacturers Association, Philadelphia Eagles Professional Football Club, Buffalo Bills Professional Football Club, Monsanto Corporation, and the Consumer Product Safety Commission.

NAIRS SPORT-RELATED INCIDENCE CHARTS

1975-1976

LEGEND for tables 1-4

(1) Number of teams completing NAIRS-I or NAIRS-II for entire season, this sport.
(2) Average squad size per team x number of programs.
(3) Number of significant injuries/illnesses (cases) per 100 athletes
Significant = at least one week absence from participation, or dental injury.
(4) Number of reportable cases per 100 athletes
Reportable = at least one day absence from participation, or concussion or dental injury.
(5) Number of different athletes experiencing a significant injury/illness per 100 athletes.
(6) Number of different athletes experiencing a reportable injury/illness per 100 athletes.
***(7) Number of significant cases per 1000 exposures
Exposures = (average practice squad size) x (number of practices) + (average contest squad size) + (number of contests)
(8) Number of reportable cases per 1000 exposures

***preferred rates for comparative purposes

Table 1
COLLEGE AND UNIVERSITY SPORTS (MALE)

Sport		(1) Programs	(2) Athletes	(3) Sign Case Rate/ 100A	(4) Total Case Rate/ 100A	(5) Sign. Athl. Rate/ 100A	(6) Total Athl. Rate/ 100A	(7) Sign. Case Rate/ 1000E	(8) Total Case Rate/ 1000E
1.	Wrestling	12	300	48.6	128.9	38.2	66.1	4.6	12.1
2.	Volleyball	1	10	39.9	89.8	29.9	53.9	3.1	7.7
3.	Football (Fall)	42	3738	27.9	98.8	23.7	55.1	3.3	11.8
4.	Ice Hockey	9	225	25.3	117.3	21.8	58.7	2.2	9.4
5.	Gymnastics	7	140	22.1	39.2	19.8	30.5	2.0	3.5
6.	Basketball	30	450	21.6	82.7	19.2	50.2	1.9	5.4
7.	Lacrosse	4	124	18.5	56.4	16.8	40.3	3.2	9.8
8.	Soccer	15	390	15.6	59.7	13.8	37.0	3.0	8.8
9.	Football (Spring)	23	2001	14.5	39.5	13.8	32.8	7.1	19.8
10.	Baseball	11	352	13.6	27.5	12.2	23.0	1.6	2.6
11.	Track & Field, ind.	6	252	9.5	15.4	8.3	11.8	1.6	2.6
12.	Track & Field, outd.	8	288	8.3	13.5	7.2	13.0	1.5	2.5
13.	Cross Country	11	143	6.2	17.3	6.2	15.2	0.9	2.4
14.	Swimming-Diving	7	168	5.9	11.2	5.4	9.8	0.5	0.9
15.	Rugby	1	36	5.5	47.1	5.5	38.8	1.5	12.6
16.	Fencing	1	21	4.7	4.7	4.7	4.7	0.8	0.8
17.	Tennis	6	54	1.8	7.3	1.8	7.3	0.3	1.4
18.	Golf	4	36	0.0	0.0	—	—	—	—

Table 2
COLLEGE AND UNIVERSITY SPORTS (FEMALE)

Sport		(1) Programs	(2) Athletes	(3) Sign. Case Rate/ 100A	(4) Total Case Rate/ 100A	(5) Sign. Athl. Rate/ 100A	(6) Total Athl. Rate/ 100A	(7) Sign. Case Rate/ 1000E	(8) Total Case Rate/ 1000E
1.	Gymnastics	9	117	22.2	42.7	20.6	32.7	1.7	3.2
2.	Basketball	20	320	17.4	60.5	15.3	41.5	2.2	7.5
3.	Volleyball	13	195	11.7	31.1	10.7	27.5	1.8	4.9
4.	Track & Field, ind.	2	60	11.6	23.2	11.6	21.5	2.3	4.7
5.	Softball	10	200	10.4	28.5	10.4	25.0	2.1	5.6
6.	Track & Field, outd.	6	156	10.2	15.9	8.9	12.7	1.5	2.4
7.	Cross Country	3	30	9.9	19.8	9.9	16.5	1.5	3.0
8.	Ice Hockey	1	15	6.6	6.6	6.6	6.6	2.3	2.3
9.	Fencing	3	33	6.0	9.0	3.0	6.0	0.8	1.2
10.	Tennis	6	78	5.1	11.5	4.5	10.2	1.0	2.5
11.	Field Hockey	14	308	4.8	25.2	4.2	21.0	0.9	4.8
12.	Swimming-Diving	8	136	2.2	15.4	2.2	13.9	0.2	1.7
13.	Lacrosse	4	108	1.8	8.2	1.6	8.2	0.5	2.2
14.	Golf	1	10	0.0	0.0	—	—	—	—

Table 3
HIGH SCHOOL SPORTS (MALE)

Sport	(1) Pro-grams	(2) Ath-letes	(3) Sign. Case Rate/ 100A	(4) Total Case Rate/ 100A	(5) Sign. Athl. Rate/ 100A	(6) Total Athl. Rate/ 100A	(7) Sign. Case Rate/ 1000E	(8) Total Case Rate/ 1000E
1. Football (Fall)	13	650	16.9	55.3	15.6	37.9	2.4	7.4
2. Soccer	2	50	11.9	44.0	11.9	34.0	2.2	7.8
3. Cross Country	1	19	10.5	26.3	10.5	26.3	1.6	3.9
4. Wrestling	5	150	9.9	24.0	8.6	18.7	1.4	2.1
5. Basketball	8	96	8.3	36.4	8.3	27.0	1.0	4.1
6. Ice Hockey	12	252	6.7	43.6	6.3	31.8	1.2	7.6
7. Football (Spring)	1	51	5.8	7.7	5.8	7.7	4.2	5.6
8. Lacrosse	1	27	0.0	33.3	—	25.9	—	2.2
9. Baseball	4	60	0.0	4.9	—	4.9	—	0.8
10. Track & Field, outd.	4	96	0.0	2.0	—	—	—	—
11. Tennis	1	15	0.0	0.0	—	—	—	—
12. Golf	1	12	0.0	0.0	—	—	—	—

Table 4
HIGH SCHOOL SPORTS (FEMALE)

Sport	(1) Pro-grams	(2) Ath-letes	(3) Sign. Case Rate/ 100A	(4) Total Case Rate/ 100A	(5) Sign. Athl. Rate/ 100A	(6) Total Athl. Rate/ 100A	(7) Sign. Case Rate/ 1000E	(8) Total Case Rate/ 1000E
1. Tennis	2	24	4.1	8.2	4.1	8.2	0.9	2.0
2. Basketball	3	36	2.7	2.7	2.7	2.7	0.2	0.2
3. Field Hockey	1	28	0.0	17.8	—	14.2	—	3.9
4. Volleyball	3	165	0.0	1.2	—	1.2	—	0.3
5. Gymnastics	1	20	0.0	0.0	—	—	—	—

Figure 1
EXAMPLE OF AN EPISODE INJURY REPORT

NAIRS ACTIVITY REPORT FOR PERIOD 07/01/76 to 10/11/76
INSTITUTION/CLUB 00050518 Date 10/11/76 PAGE 0006

******CASE ABSTRACT******

Sport	(05)	Football
Participant		5049
Episode		01
Date of Onset		Month = 08 Day = 13

Date of Return		Month = 08 Day = 22
Time of Onset	(3)	Evening
Season	(1)	Pre-season period
Diagnosis	(33413)	Hamstr strain, med. belly, 1st D
Extremity	(2)	Left
Primary Mechanism	(4)	Stretch
Occasion	(29)	Varsity Sport Practice/contest
Source of Diagnosis	(22)	Team D.C., Community Based
Position	(80)	Tight End
Activity	(93)	No Contact, Sprinting
Situation	(33)	Passing Play 3rd Quarter
Surface	(42)	Astroturf, > 3 Yrs Old
Protection of I B P	(5)	Customary Uniform
Climate Condition	(3)	Warm, Moderate Humidity
Equipment Involved		
Nature of Ill/Inj	(1)	New Problem, This Sport-Season
Action Taken	(1)	Not Hospit, Not Confined to Bed
Principal Management	(4)	Formal Physical Therapy

******CASE ABSTRACT******

Sport	(05)	Football
Participant		5059
Episode		01
Date of Onset		Month = 07 Day = 19
Date of Return		Month = 07 Day = 27
Time of Onset	(1)	Morning
Season	(1)	Pre-season period
Diagnosis	(40413)	Med Hamstr Strain, Distal, 1st DG
Diagnosis	(40052)	Hamstring Tendinitis
Extremity	(1)	Right
Primary Mechanism	(6)	Overuse
Occasion	(27)	Varsity Sport Practice/conditioning
Source of Diagnosis	(71)	Athletic Trainer, NATA Cert Mem
Position	(11)	Running Back Halfback
Activity	(94)	No Contact, Endurance Running
Situation	(64)	Running Drills 4th Fourth of Practice
Surface	(11)	Grass
Protection of I B P	(5)	Customary Uniform
Climate Condition	(7)	Hot, High Humidity
Equipment Involved		
Type	(610)	Shoes, Lowcut, Standard Cleats
Brand	(032)	Riddell, Inc.
Vintage	(1)	New This Season
Nature of Ill/Inj	(1)	New Problem, This Sport-Season
Action Taken	(1)	Not Hospit, Not Confined to Bed
Principal Management	(4)	Formal Physical Therapy

Example of Report Obtained from NAIRS Data

National Athletic Injury/Illness Reporting System (NAIRS)

Artificial Surface: College Football and Soccer Injuries 1975

The attached tables are presented to put in preliminary perspective the association of artificial turf to turf-related injuries in college football and soccer as an exercise to demonstrate the computer capability of NAIRS. Having good turn-around time at the computer, the data for these tables were retrievable within two hours.

The football data were obtained from 41 college-university teams from across the country which subscribed faithfully to NAIRS-I procedures for the entire 1975 season. Fifteen teams contributed a full season of soccer data. NAIRS-I is the version of the system which accommodates the optimal amount of variables feasible on a surveillance basis. Variables within NAIRS-I include surface, helmets, shoes, and other protective products.

For this exercise, particular injury problems alleged to be associated with artificial surfaces were chosen. To display the data, the injuries were selected by two respective criteria: REPORTABLE cases and SIGNIFICANT cases.

Except for concussion, a REPORTABLE case requires an absence from participation for at least one day after day of onset. This permits cautious overnight medical observation of a potentially limiting injury prior to a decision as to continued play. Concussions require merely cessation of athlete's activity for evaluation, whether for ten minutes or ten days.

A SIGNIFICANT injury is a reportable injury which keeps the athlete out of participation for at least one week. This classification helps accommodate the widely variable reporting and management of the athlete with a minor injury: some will be kept out of practice until the game while others will be told to work it off. It is the SIGNIFICANT injury that should receive priority attention in the search for problems and patterns. For this report, fractures were displayed as MAJOR as well (participation interrupted for at least three weeks) to provide better perspective in evaluation of this type injury.

The tables were displayed as to SPORT-RELATED (games and practices) and GAME-RELATED (official games only) for further perspective. The GAME-RELATED data are considered more meaningful because "the game" equalizes the intensity of activity. The use of practice time varies widely among coaches, and the turf may play a coincidental role in this regard. NAIRS is also capable of delimiting interest to home games, away games, practice-skill training, practice-conditioning, and practice-scrimmages.

Finally, the data are expressed as rates per athlete-exposure in order to provide perspective in this regard as well. Athlete-exposures are calculated by multiplying the average practice squad size times the numbers of practices on a surface and/or the average game squad size times the number of games on a surface. For rates, these calculations were divided into the cases experienced and multiplied by a common number to arrive at an interpretable whole number.

For this report, the unit of 1000 athlete-exposure (games) was utilized for GAME-RELATED data, while 10000 athlete-exposures (games and practices) was used for normalizing SPORT-RELATED data.

All injuries were reported on a weekly basis to NAIRS, with the weekly reports including the frequency of practices and games on respective surfaces that week plus the average squad size at practices and games that week. Consequently, end-of-season recall problems were avoided.

Delimitations

1. These data constitute the results from but one season. While the number of athletes constitutes the largest number followed to date with such detail, one year's data have no known stability. Ensuing years will have to determine whether the patterns displayed here will prevail or fluctuate widely.
2. These data cannot be used to provide evidence of cause and effect. They only show the association of selected injuries with surfaces which, with defensible logic, may be sharing in the mechanism of injury or the severity of the injury. Far more sensitive (and expensive) procedures would have to be utilized to examine with validity the direct association of a surface to an injury.
3. These data do not accommodate the possible influence of various helmets and shoes on the incidence of injuries associated with respective surfaces. Such considerations will be pursued in the near future by NAIRS.

Comment

It is not the purpose of this report to provide a studied conclusion on the hazards or attributes of artificial surface. More factors warrant analysis and more seasons are required to arrive at the advantage of trend line examination. Nonetheless, Chi Square analysis was performed for each category of injury to examine the statistical significance of the injuries associated with natural and artificial turfs in terms of relative exposure to these surfaces, and the attached tables do permit a few generalizations.

1. Artificial turf did not constitute any imminent hazard to the college football and soccer teams experiencing it in 1975. When attention is limited to significant injuries, no essential surface-relatedness was found. In fact, the spuriousness of interpreting injury data which mix minor and significant cases is revealed.
2. "Artificial turf" is too general a concept for decision-oriented examination of injury data. Different manufacturers produce different surface systems by different patents and processes. To pursue discernible patterns of reportable or significant injuries, it would be best to set aside the generic term for respective brand names.
3. More subscribing teams are needed to gain a respository of injuries of sufficient size to permit examination of brands and multi-variable associations. To break down some of these initial tables to examine associated factors (e.g., vintage, athlete characteristics, equipment characteristics, specific diagnosis, etc.), more cases are required to have usable N in a matrix cell. To illustrate, because Poly turf accounted for only 0.2% of all sport-related exposures, it was excluded from Table 3 (Sport-Related Case Rates).
4. The considerable variation among respective team's injury experiences preclude generalizations on artificial surface based on a particular team's experience or a small number of teams' experiences.

NOTE: This project has been funded in part with Federal funds from the United States Consumer Product Safety Commission under contract number CPSC-C-70-0050. The content of this publication does not necessarily reflect the views of the Commission, nor does mention of trade names, commercial products, or organizations imply endorsement by the Commission.

National Athletic Injury/Illness Reporting System

Table 1
COLLEGE FOOTBALL — 1975 SEASON
SURFACE EXPOSURE BY ATHLETE-EXPOSURES (41 TEAMS)

	Natural turf	Artificial turf	Astro turf	Tartan turf	Poly turf
Game Exposures					
N	14214	9588	5920	3007	661
%	60	40	25	13	3
(Home Games)					
N	7344	5115	3067	1712	336
%	59	41	25	14	3
(Away Games)					
N	6870	4473	2853	1295	325
%	61	39	25	11	3
Practice Exposures					
N	157270	126666	91201	35465	0
%	55	45	32	13	0
Total Season Exposures					
N	171484	136254	97121	38472	661
%	56	44	32	13	0.2

Table 2
COLLEGE FOOTBALL — 1975 SEASON
CASE RATE PER 1000 ATHLETE-EXPOSURES
FOR SELECTED *GAME-RELATED* INJURIES

	Natural turf	Artificial turf	Astro turf	Tartan turf	Poly turf
Reportable fractures	3	2	2	2	2
Major fractures	2	1	1	1	0
Reportable abrasions	—	1	1	—	0
Significant abrasions	0	0	0	0	0
*Reportable concussions	3	6	4	7	11
Significant concussions	—	—	—	—	0
Reportable knee injuries	11	13	13	16	8
Significant knee injuries	5	6	5	8	5
*Reportable ankle injuries	7	11	11	10	12
Significant ankle injuries	3	3	3	3	3
*Reportable foot injuries	1	3	4	3	0
Significant foot injuries	—	—	—	—	0

*p < .01, Natural vs Artificial

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Table 3
COLLEGE FOOTBALL — 1975 SEASON
CASE RATE PER 10000 ATHLETE-EXPOSURES
FOR SELECTED *SPORT-RELATED* INJURIES

	Natural turf	Artificial turf	Astro turf	Tartan turf
Reportable fractures	5	5	5	6
Major fractures	2	3	2	3
Reportable abrasions	—	1	1	—
Significant abrasions	0	—	—	0
*Reportable concussions	6	8	5	11
Significant Concussions	1	—	—	—
*Reportable knee injuries	20	25	24	27
Significant knee injuries	9	11	11	12
*Reportable ankle injuries	14	20	21	16
Significant ankle injuries	5	6	6	5
*Reportable Foot Injuries	3	5	5	5
Significant foot injuries	1	1	1	1

*p < .01, Natural vs Artificial

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Table 4
COLLEGE SOCCER — 1975 SEASON
SURFACE EXPOSURE BY ATHLETE-EXPOSURES (15 TEAMS)

	Natural turf	Artificial turf	Astro turf	Tartan turf	Poly turf
Game Exposures					
N	3418	749	498	0	251
%	82	18	12	0	6
(Home Games)					
N	1747	371	140	0	231
%	82	18	7	0	11
(Away Games)					
N	1671	378	358	0	20
%	82	18	17	0	1
Practice Exposures					
N	17167	2405	0	0	2405
%	88	12	0	0	12
Total Season Exposures					
N	20585	3154	498	0	2656
%	87	13	2	0	11

Table 5
COLLEGE SOCCER — 1975 SEASON
CASE RATE PER 1000 ATHLETE-EXPOSURES
FOR SELECTED *GAME-RELATED* INJURIES

	Natural turf	Artificial turf	Astro turf	Tartan turf	Poly turf
Reportable fractures	1	3	0	0	8
Major fractures	0	1	0	0	4
Reportable abrasions	0	0	0	0	0
Significant abrasions	0	0	0	0	0
Reportable concussions	1	0	0	0	0
Significant concussions	0	0	0	0	0
Reportable knee injuries	2	3	0	0	8
Significant knee injuries	1	1	0	0	4
Reportable ankle injuries	2	3	2	0	4
Significant ankle injuries	1	0	0	0	0
Reportable foot injuries	2	1	0	0	4
Significant foot injuries	1	0	0	0	0

Question and Answer Period

Question #1: Has there been an attempt to use, *Standard Nomenclature of Athletic Injuries*. I notice you have "hamstring", "charlie horse" and so forth on the forms. Is this because there are student managers doing the reporting of information?

Clarke: The Standard Nomenclature of Athletic Injuries was a product of two years' effort of a subcommittee of the AMA back in the mid-sixties. Its purpose was to bring some sense out of the "garbage" words and other non-specific terms used by medicine and those associated with sport, to make sure that when people used the word, it meant the same thing to the next person. It was also used in the programs of athletic training and I understand some medical schools as a training device to make sure people were more precise. The AMA promised, at that time, after one year's experience, to put the subcommittee back to work based on the feedback and then do the job right in the second edition. That first edition is still the only one available. NAIRS built the medical terminology around that publication so there would be a reference but it did not confine itself to the standard nomenclature. It fitted in all sorts of improvements with medical help which would have been included in the nomenclature book, had there been the chance to revise it. It is our goal to find some "angel" that would allow us to get the copyright release from the AMA and put a second edition of standard nomenclature out and put the NAIRS codes with it so that both would be available together. We have found out from the athletic trainers in the schools, at least the ones that produce the student athletic trainers, that it is very helpful to have a reference so they can teach the student what a word means and then show how to apply it in an actual setting. But, we are not confined to this standard nomenclature, if we find deviations from it helpful. Also, there are a lot more things that go wrong with an athlete than what we have in the standard nomenclature book.

Question #2: How do you handle the injuries sustained by an athlete not indigenous to play, such as assault? A fight, for example?

Clarke: The first injury that came to NAIRS was a fight and we immediately put it in the code and it's the same code number now for all sports — men and women. Again, we make sure we have the capability, of coding whatever can go wrong. On the Case Abstract, which is that one sheet of paper when if somebody gets hurt, after the diagnosis is given, the first think I put down is the occasion using a simple check. The 10-series under occasion is non-sport related. If it had nothing to do with the sports program, it has to be within the 10-series and that would include getting hit by a car or a passenger in a car, or in school setting non-physical education, *etc.* If it's part of the varsity program, it's in the 20-series and the 20 is a home game, 21 is away game, 22 would be in the locker room, and after you get to the higher 26-27-28-29 during practice sessions in order to capture where within the varsity program that injury occurred. But again, the computer can look for that "2", and say sport related or it can look for the "1", non-sport related, and then within that we have a breakdown. Going to the 30 series is sub-varsity sports, especially in college football there is a lot of exchange between sub-varsity and varsity. It required a long discussion at the beginning meeting to capture all these things, so it was very obligate at the beginning. Club sport, I think is the 40 series and 50 is the physical education, 60's is recreational sports, *etc.*, on down the list. Occasionally, we still get an episode that doesn't fit and we modify the code. But, I think we now have captured virtually any way that somebody can get hurt and record it meaningfully.

Question #3: How many institutes do you have participating and what do you project after that point?

Clarke: I don't know how to answer that because that slide shows we have 42 colleges following football and maybe 18 following hockey and they may be different institutions or they may be the same. Once in awhile I do ask Bud or John, how many different institutions do we have, but I can never remember. I'm guessing that we have 100 different colleges and high schools volunteering to use the system at this time in maybe 18-20 sports. Then we deal with male or female and in some of those sports like basketball; we have male basketball and female basketball. But, we have the horizontal coverage now to some degree to test the codes. I would like to have, a minimum of 50 institutions following a given sport before I get comfortable in being able to analyze the variability in experience as well as the meaningful mean rate. Shortly, we will have a coefficient of variation attached to the mean case rate to reveal in a very succinct fashion the amount of variation there is around that mean. That mean may not represent anything other than an arithmetical calculation or it may mean, that is where everybody is. A coefficient of variation, is a very helpful tool for a single index for the amount of variation between institutions on that injury rate. If different institutions have different experiences, then you cannot generalize. You have to go deeper to find out what's the cause.

Question #4: The in-depth surveys on some of the different sports have been summarized from time to time, is there any plan to put out an annual summary of in-depths? It's a pain to go through them one at a time.

Verhalen: I'll have to say that if you have been following the budget process in the Federal Government at all, "No", there is no plan to put out an annual summary. However, when I say that there is no plan to put out the annual summary, I'm talking in terms of a routine dissemination of data. If you have questions, whether you have them quarterly, annually, or whatever, all you have to do is call the Clearing House or write to us and we'll give you everything we have, including the in-depth investigations.

Questioner's response: Let me say that CPSC has been very cooperative anytime I ever needed anything, its just that a trip to Washington to go through the files and pick out information on the summaries does take some time.

Verhalen's reply: I think that is one way to do it, if you have an opportunity to get to Washington. We very much appreciate it when people can, because it reduces our workload.

They do their own search and we make the xerox facilities available. But, let me say that we do not want to discriminate between those of you who can get to Washington and those of you who may be in the Northwest and can't get to Washington. If you write us, or call us, we'll do the same thing. We'll xerox the in-depth investigations and send them to you. We used to do all of this free of charge. Now in point of fact, because of the case load, we generally do charge beyond the first $25 worth of search. But, if you will call the Clearing House, you can work out with them a way to reduce your single requests down to perhaps 7 or 8 requests, each one of which would by themselves be less than $25. We're happy to cooperate with you.

Question #5: One of the things that you deal with is reasonable risks. Would you please speak to that point, and how do you determine that?

Verhalen: I wish I could. The concept really is unreasonable risk and it's written into the Consumer Product Safety Act which Congress in its wisdom failed to define for the Commission. They failed to define it because there is no practical definition which can be uniformly applied across all products. The concept of unreasonable risk obviously embodies a number of sub-concepts. These would include the possibility for an engineering fix, for instance on a particular product. Either a design fix or a quality control fix can be implemented. It includes the possibility of developing a reasonable fix within a short period of time. Let me use wringer washers as an example. For years, there has been a lot of injuries associated with wringer washers, some of which you have heard in a "junk yard" context. The problem is that a wringer washer has an average life of 27 years. So any standard that might be developed unless it would have substantial impact on the production of injuries — by substantial — I mean approaching 100% effectiveness — is likely to have a very low net effectiveness on the injury rate because of the slow penetration of new products meeting the standard. Therefore, even though injuries may be relatively severe — if they are relatively infrequent — it would not be considered an unreasonable risk in this context because it would take upwards of 14 years before you would even approach 50% of the problem. On the other hand, if you are dealing with something like a pacifier, where the life span of the product is very short. As a matter of fact, most families probably own more than one, for any particular infant over that infant's time when he would be using it. A standard would be effective conceivably within the first year to year and a half and even though the injuries may be relatively slight. In some cases, of course, strangulation and death of the infant, but there are also minor lacerations and sometimes choking incidents, but not fatal injuries. This might be considered an unreasonable risk because its a very easy engineering fix to make a single piece molded unit rather than a multiple piece unit; its a fairly easy fix to make it a relatively soft plastic instead of a hard one that can break, develop sharp edges and injure the child's sensitive skin, *etc.* So, a relatively slighter injury but much more frequent, would be considered an unreasonable risk. So each product is considered independently. We also take into account the economic impact — whether or not there are substantial re-tooling requirements on the part of the manufacturer. The mattress flammability standard which was generated by the Commission, for example, was applied to an industry which is very much a "mom and pop" type of industry. While there are major mattress manufacturers, there are an awful lot of very, very small manufacturers who put out just a few hundred units a year and the flammability standards test which are required as destructive tests are very expensive to the industry. So, when you are developing standards like this, you have to take into account the impact on the industry, the impact on the cost of the product, and the impact on the cost of medical care. So, it's something that has to be redefined for each and every product and I will contend that we will never come up with a definition that something is or is not an unreasonable risk without somebody taking the opposite side of the issue. You are never going to be right to everyone.

Clarke: In the world of sports it gets more complex than just in the ordinary public situation. We had one experience last winter, I'd like to share with you that shows how people can, when they talk to each other, get something done. Through almost simultaneous interest between some things that were coming into CPSC, to which an individual was assigned. I don't remember who specifically, but this involved a Hooker blockomatic-tacklematic machine. Those of you who don't know what that is, it's a suspended dummy apparatus but it's on a spring loaded device. It is propelled at the person. You can put it back on one spring and it comes at him equivalent to a 100 pound object and if you put it on another one, it comes at you with 200 pound force. You can put them on together and it comes at you as a 300 pound object.

As a result of the use of that device, some very severe injuries began to occur last fall. Joe Torg at Temple, CPSC and NAIRS sent a card or telephone inquiry to the people using the apparatus, requesting any experiences they had with the Hooker apparatus. This was in the fall. We got all this information compiled. The NCAA Committee on Competitive Safeguards and Medical Aspects of Sports reviewed these data in January. Two days later, the Committee came out with a very firm position saying that it was unreasonable risk. Instead of the particular apparatus, they used a more generic term of any spring-loaded device or any kind of self-propelled device is unreasonable risk because of unnecessary additional risk. There are other ways of teaching blocking and tackling that do not have an additional hazard of that dummy coming at them at that speed. Therefore, the Committee took the position that it should not be used in football as an unnecessary additional risk and they also recommended to those that had them, to disconnect the self-propelled device. We did not formally request or suggest that they do anything but notify these people because this would require a lot of legal process.

The National College Football Coaches Association picked that up and put it in the front of their current football book this year as well. It is part of the ethical conduct listing and hopefully the people will read the beginning of the book as well as the rest. But that was one way that showed unreasonable equals unnecessary additional risk.

Round Table Discussion
Epidemiology of Sports Injuries

Moderator: Norman Johnson
Lincoln University
Jefferson City, Mo.

A. *Discussion: NAIRS AND EPIDEMIOLOGY*

1. Weaknesses of past studies of injuries as compared to NAIRS were pointed out. These included such things as:
   a. Multiple definitions of injury
   b. Lack of consistency in recording data
   c. High variability of injury definitions
   d. Literature searches have indicated that the most "notable" accomplishment of past studies was that the sprain was the most frequent sports injury.
2. A point was made regarding the misuse by the media of the kind of data that was furnished by the limited studies of the past dealing with sports injuries.
3. Cost was cited as a reason why a system such as NAIRS was not undertaken before this time. For data to be of real value, one must have information for a period of several years. Also a change in the staff and/or leadership during a study of this type often leads to reduced priority and effort.
4. Definition of epidemiology was discussed. Most studies do not meet the criteria in the strictest sense of the word. The last two years of the Blyth-Mueller study met this criteria better than in the beginning years.
5. A point was made that data such as that furnished by the Wisconsin Insurance Plan could be helpful in studying epidemiological factors. However, these data may not be used to make inferences to other states because of geographical differences in patterns of injury.
6. It was also pointed out that epidemiology will provide the data that will enable responsible safety groups to make correct judgments regarding sports injuries and to recommend necessary and desirable changes to those responsible for sports as well as to sports participants.
7. A feeling was expressed that coaches would appreciate obtaining valid and reliable data such as NAIRS will furnish to help them handle the injury problems.

B. *Discussion: HEW Survey*

1. Purpose of the HEW survey was to obtain a compilation of high school and college injuries and fatalities on a national basis. It is the first epidemiological study conducted on a national basis.
2. The study sample was randomized and the schools in the sample were stratified by state. A total of 3800 schools participated in the study.
3. A feeling among the discussion group was that the survey might stimulate high schools and even colleges to improve their injury recording systems.

C. *Discussion:* Utilization and implementation of data as furnished by NAIRS and the HEW survey at the "grassroots" level

1. It is important to communicate with people at the "grassroots" level so that they receive injury information, are able to interpret it, and then implement appropriate changes in their respective programs.
2. Terminology and analysis techniques of the researcher are not always easy for the practitioner to grasp and understand, particularly in small out-of-the way schools.
3. It should be the responsibility of those in professional preparation departments of physical education and sport to prepare future teachers, coaches, and athletic trainers to understand the sports injury problem including data systems such as NAIRS. They in turn will disseminate such information to others at institutions where they will eventually teach or coach.
4. It would be helpful if a way could be found to effectively pool the knowledge of researchers and make it available to the practitioners.
5. Certification of coaches appears to be a realistic step in order to have persons qualified to understand the nature of the injury problem and do something about it.

D. *Discussion:* Points related to epidemiology of sports injuries

1. Two examples were given of the importance of a strong data base in order to make correct decisions. They are:
   a. Our lack of knowledge in such areas as predisposition to injury of participants. For example tight versus loose jointedness.
   b. The instances arising where young girls (14 yrs. of age) are participating against boys in a collision type sport such as football.
2. The importance of understanding the behavioral patterns of sports participants and their relationship to sports injuries.

Safety in College Athletics

Mel Blickenstaff
Indiana State University
Terre Haute

It is a distinct honor for me to be asked to speak to you about a subject that indirectly I have been intensely interested in most of my life, that of safety in athletics. There is such a fine line between what a trainer does, and what you people believe in that I hope the points I am about to present will be of interest to most of you.

I feel certain that you as educators and administrators in the field of safety have similar beliefs to those of us who are in the field of athletic training. The only real difference is so basic that it is a question of which came first the chicken or the egg? To an athletic trainer, safety means trying to prevent injuries. To a safety educator, safety means trying to prevent an accident. What is the difference? If we have an accident the end result is an injury, and this is what we are both concerned about.

If we are to do the best possible job of attempting to promote safety and prevent injury, many aspects must be taken into consideration. Athletic trainers spend approximately 60% of their time in this effort so it would seem logical to mention many of the ways listed in Klafs and Arnheim (7). It is extremely difficult to list these factors in their order of importance, but my personal opinion would be:

1. A good physical examination.
2. Must have a complete medical history.
3. Trainers must be utilized in all schools that have competitive athletic programs.
4. A doctor should be present at all major competitive events, and on call for all other events including practice.
5. Good coaching techniques must include, *common sense*.
6. Strength, conditioning, and flexibility routines must be a part of each day's routine.
7. Adequate rules must be instituted to promote safety, and there must be good officiating to enforce these rules.
8. Careful treatment and consideration of the injured athlete can prevent further injury.
9. Careful attention to the selection and fitting of all gear and equipment that the athlete will be using.
10. Constant supervision of all playing facilities, playing surfaces, and dressing rooms.
11. Taping, padding, and wrapping should be used only when needed (probably used too much by trainers).

The Organizing Committee for this Conference suggested that my speech include recent trends in the development of sports equipment, fitting equipment, and certain other specialty devices. I will concentrate primarily in these areas, but will also comment on several others.

Before getting around to specifics there are several questions I would like to ask: Does anyone know exactly how many serious injuries are caused by faulty equipment? This same question could be asked about the automobile. In answer to these questions, I don't think we know for sure. I once heard it said that it only took one loose nut behind the steering wheel to scatter a 1000 parts over the country side. I feel there is a parallel here with some coaches. I refer to the coaches that place winning above the athlete's safety and future health. In answer to my first question, we must keep good records so that accurate information is available. I feel that manufacturers are constantly improving their products, but how can we know for certain unless we have statistics for purposes of comparison?

In an attempt to gain further insight into the cause of athletic injuries it was necessary to review some of the more current literature. Blyth and Mueller (1) presented a three part series of articles which covered a study of high school football injures during the years, 1968-1972. The North Carolina High School Football Survey helped answer some of the where, when, and hows of athletic injuries. The report substantiated that knees and ankles ranked the highest of the more common injuries. Head and neck injuries rated much higher than anticipated. Causes could be traced to faulty or ill-fitting equipment, torsion from twisting movements, collisions or contact, inadequate care, improper coaching techniques, illegal acts, and a host of other factors. Part three stressed coaching as a possible factor, and I personally feel this aspect can't be stressed enough.

The Physician and Sportsmedicine carried a special report on "What's the Story on Sports Equipment?" (9) This is an excellent article indicating that there is a joint effort by the NCAA, NFSHSA, NATA, team physicians, manufacturers of sports equipment, and others to form a research organization known as NOCSAE. The purpose being to establish performance standards for sports equipment. So far standards have been set for football helmets only. The government's Consumer Product Safety Commission is beginning to enter into the picture. Some funding for studies of quality and safety of sports equipment has been offered. Examinations of special spring-loaded training devices have been made, and recommendations to eliminate the dangerous construction of aluminum baseball bats. It is hoped that more money will be made available to help do research in sports safety.

Numerous people feel that manufacturers have improved their equipment to the point that the coach and the athlete have a false sense of security. This feeling has been echoed by Dr. Donald Cooper, Team Physician, Oklahoma State University. In a speech as part of the Medical Symposium at Indiana State University this past summer, Dr. Cooper stated that good headgear and face guards have advanced to the point that it is causing head and neck injuries. His point was that if the face guards were taken off, see how many athletes would continue to use their heads as "battering rams."

Dr. Cooper also stated that if there are very many other law suits of the magnitude of the Riddell case, (a $5.3 million case was lost in a Florida Court but is now being appealed) football will be a sport of the past. It is obvious that manufacturer's costs will rise as more and more safety is built into the equipment and the cost of liability insurance continues to rise. Dr. Cooper further stated that the game of the future, which will replace football, will be soccer. These comments brought a strong rebutal from a leading manufacturer and pioneer of the face guard.

Many sports have their own individualized equipment problems, but this discussion will be confined primarily to football. The greatest concern seems to center on headgear, face guards, shoulder pads, and shoes. Other discussion will include coaching techniques, rule changes, and officiating.

To insure the maximum safety of each competing athlete the best quality equipment which the school can afford should be purchased. Protective equipment should be individually fitted, and should be purchased based on the combined thinking of the coach, trainer, team physician, and the equipment man. Regardless of the price, the best piece of equipment is worthless if it doesn't fit. The following suggestions are offered as an aid for fitting the most essential pieces of football equipment:

Headgear

Headgear may be classified into one of three basic types: liquid-airfilled, padded, and suspension. My personal preference would be the liquid-airfilled if the problem of maintenance could be eliminated. Our problem with this type of headgear is a repair problem. We can't get spare parts when we need them. Regardless of type, the headgear must be individually fitted to the athlete's head contour. The headgear must be placed so that when properly positioned the front portion will rest approximately one finger width above the eyebrows. Earholes must line up with ear openings. Suspensions must be shimmed with special sponge padding to provide uniform contact at all points. All fittings must be made before the chin strap is adjusted. Cheek pads must be correctly sized, and the chin strap may now be adjusted. Double chin straps, forehead and neck pads can provide added safety.

When fitting the liquid-air type always fill the top first to assure the correct height. The top cord of the suspension type helmet must be constantly checked to see that it doesn't work loose. Tuf-skin applied to the knot will prevent this.

Always take into account the long haired athlete that has just come from the barber shop. Routine weekly checks must be made to see that all parts of the headgear are in tip-top condition.

Excellent drawings and fitting instructions may be obtained from an article which appeared in the January, 1973, issue of Cramer's *First Aider*. (4)

Face Guard

The face guard has probably had a dual effect on the game of football. Not only has it provided the desired protection for the face, but also has added a new dimension to tackling and blocking. Current rule changes should help to return this specialized piece of equipment to its intended purpose.

Materials and styling vary with the manufacturer, but the original intent was to provide maximum facial protection. To attain this protection the mask must be attached in such a way that it can be removed in case of emergency, and the best method is a cut-away type of attachment. The guard must be installed at a two-finger width from the nose. Great care must be taken to center the guard on the headgear to prevent twisting. Center bars give added protection without sacrificing the field of vision, and athletes should be encouraged to use this type.

Shoulder Pads

Shoulder pads are usually classified into three basic types: flat, cantilever, and wrap-around. The flat pad is commonly worn by quarterbacks, it is light and does not restrict the passer's throwing ability. Protection has been sacrificed and many shoulder injuries result to the acromioclavicular joint because the pad rests directly on the shoulder.

The cantilever pad is used by most backs and linemen. Its construction allows the force of impact to be dissipated to the chest and to the back rather than directly to the shoulder. The outer pad sets above shoulder level on a type of spring, thus providing added protection before the final impact is transmitted to the shoulder.

The wrap-around type pad is basically a modified cantilever construction. It is designed to distribute impact over a much greater area by a special system of pockets located in the front and rear. This pad has a special fitting technique in which the athlete's coat size determines the pad size.

Most shoulder pads are fitted one finger width from the neck and two fingers from the deltoid cap. Acromioclavicular channels should be properly located when the pad is in its correct position and is firmly laced or strapped in place. Pads should be carefully selected according to the player's position, and should incorporate those features which give maximum protection.

Shoulder pads should be checked weekly for cracks, loose rivets, frayed laces, and any other form of wear that could prove hazardous.

Linebackers and defensive linemen could probably reduce the "pinched nerve" syndrome, by the use of collars. The collar must be correctly positioned. The air type gives better protection than the usual solid sponge type.

Shoes

Probably no piece of equipment is more important than the athlete's shoes. Many factors must be taken into account in determining the efficiency and safety of the athlete's performance. With the development of artificial turf many new shoe types have been used, and it is not uncommon for an athlete to have as many as three or four different pairs, depending on weather conditions and the types of surface on which he will be playing.

The general rules which apply to football shoes are as follows: Uppers must be made of a good grade of leather, synthetic, or canvas. Soles should be flexible in the shank, but firm in the cleat area. Heels should fit snugly. The average football player needs a wide sole to aid in balance and stability, and also to prevent the uppers from losing their shape.

Shoes should be fitted so that there is a quarter to a half inch between the end of the toes and the front of the shoes. Correct width can be determined after the shoe has been laced and the athlete is standing with full weight on the shoe. There should be one half to three quarters of an inch width of lacing, and the widest part of the shoe should bulge slightly when squeezed together.

Many studies have been made in an effort to reduce knee and ankle injuries. Most of these began in the mid-sixties, and have continued periodically since that time. Hanley (6) recommended the removal of heel cleats. The Harvard study (8) used a bar to replace the rear cleats. The New York public schools (2) experimented with a low disc heel and also soccer type shoes. Cameron and Davis (3) performed a controlled study with a swivel type forward cleat arrangement and a skid type heel bar. Klein (8) feels that heel cleats are worthless, and are only worn because of tradition. Klein has posed a rather interesting question: "What players run on their heels?"

The combined thinking of team physicians, trainers, and researchers indicate that cleats are the most important single factor in the prevention of ankle and knee injuries. Attempts have been made to reduce the gripping power when the foot is planted by reducing the length of the cleat, changing the shape of the cleat, adding additional cleats, special cleat arrangements, swivel attachments, heel blocks, *etc*. The most widely accepted trend in the past few years seems to be the use of the soccer shoe with a molded sole and ⅜-inch cleats.

Mouth Guards

Mouth guards have been used for years by some coaches, but until recently they were not used by all. High schools were the first to adopt a mandatory rule, and later this rule was adopted by the colleges.

Many different mouth guards are available with the cost varying from as little as one dollar to as much as $35. The type made by dentists requires taking impressions and build ups, hence the higher cost. Custom fit mouth pieces utilize a tray and putty-like filler which makes perfect imprints when the teeth bite down. Suction fits are easily made by immersion in boiling water. Boxer types require no special fitting, and are least efficient.

Regardless of the type of mouth piece you prefer, most carry an insurance policy. The purpose of the mouth piece is the prevention of dental injuries and concussions.

New Football Rules

The Rules Committees of the NCAA and the National Federation of State High School Associations (NFSHSA) have made several important rule changes that deal with tackling and blocking techniques. The purpose of these changes was to prevent the use of the head and helmet as a primary means of making contact.

Many coaches have taught head blocking and tackling for years. Medical researchers have clearly shown that this technique is the major cause of head and neck injuries, and for this reason the 1976 rules were changed.

Coaching techniques must now include the use of the chest, shoulders, arms, and hips rather than the head. Assuming the coach does a good job of conditioning his athletes, head and neck injuries should decrease.

A third ingredient which is overlooked by many in the field of safety is good officiating. Not only must the officials know the rules, but must be able to interpret and enforce them under game conditions. Officials that lose control of the game certainly endanger the safety of the competitors. Good officiating is a must!

Conclusions

We know that in all competitive sports, there will be some injuries. Safety educators, researchers, coaches, team physicians, and trainers are in an excellent position to reduce the number which do occur, if we use common sense.

Assuming that each athlete has been given a thorough physical examination, the next logical step would be to start practice with a squad of well conditioned athletes. Conditioning must start during the off-season and in many schools has progressed to a year round program.

Athletes must be outfitted with the best possible equipment that the team can afford. It must be fitted correctly and well maintained or its protective value may be rendered worthless.

Ethical coaches who teach sound fundamental techniques should be employed. Winning should not be placed above the future health of the athlete.

Each competitive athletic program should have an athletic trainer to aid in the protection of the athlete's health.

Rules, officials, and officiating are of much more importance than most people think. Rules should be constantly changed to protect the athletes, and good officials must be hired to enforce the rules.

Last but not least is the area of research. Studies utilizing carefully kept records would certainly be helpful in answering the many questions of the past, with hopes that fewer mistakes will be made in the future.

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The High School Program

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Introduction

People concerned about athletic safety and in particular the injury situation come from almost every walk of life. They include athletes, coaches, trainers, parents, doctors, educators, legislators, news media, equipment manufacturers, lawyers, insurance companies and authors. Examples of some of their concerns include: 1) professional athletes expressing concern over playing games on artificial turf; 2) the American Football Coaches Association going on record as being opposed to the use of the head as a primary point of contact in football; 3) team physicians expressing strong feelings that they should have a voice in rulings on protective football equipment; 4) representatives and senators introducing legislation intended to govern amateur sports in every dimension; 5) the news media — but more on what they have been doing in a moment; 6) equipment manufacturers, one of which has dropped its entire line of protective equipment, in part I am told, because of litigation problems; 7) authors all the way from athletes and coaches to psychologists and now James A. Michener himself.

The subject of sports injuries is an emotional one regardless of the level of sports being studied. Perhaps the high school level is more emotional than most because of one or two very simple facts. First, the athletes involved are of a relatively young age. Secondly, there are far more people watching high school teams than any other level. Injuries to professional athletes, for example, are viewed not nearly so emotionally, even though their games are watched by large portions of the general public. Perhaps this is because the athletes involved are older and are being paid for what they are doing.

To dramatize how emotional the situation can become at the high school level, I need only site one actual incident that occurred in Wisconsin during our high school football program not more than four weeks ago. The initial report of the incident was received at my home late one Saturday night in the form of a phone call from the parents of the boy involved. The first reports indicated that he had fractured his neck in a football game and was in the intensive care unit of one of our state hospitals in traction and with a serious possibility of being a quadriplegic for life. Subsequent reports, some semiofficial, some rumors received from spectators, the parents once again, newspapers that became involved and several well intentioned citizens, indicated all of the following: the boy was wearing shabby equipment, the officiating in the game was very poor, there were repeated incidents of dirty tactics used by the opponent, the boy after being injured, was poorly handled in that he lay on the field for nearly 45 minutes before being removed and the final insult occurred when he was put into the emergency vehicle. There was so little concern for him as a visiting athlete that the door of the vehicle was slammed on his foot, as he lay on a makeshift stretcher.

After numerous hours of investigation by letter, telephone and personal visitation the facts were found to be as follows: the equipment the boy was wearing was perfectly adequate, the officiating was excellent, it was a hard hitting contest, but there was no dirty play, he was handled extremely well in that he was removed from the field in a minimum amount of time with all necessary precautions including the holding of the door until he was completely in the vehicle. The final bit of information is most significant. The boy was back in school the following Monday morning wearing nothing more than a small collar as a neckbrace.

Not only is this an emotional subject, but it is also an extremely complex one. It is complex not only because of the wide variety of activities involved in our sporting world, but because of the wide range of programs involved as well. References are made to injuries occurring in programs all the way from preschool through professionals, including age ranges from under 5 to beyond 50 years. The subject is further complicated by the fact that injuries can be discussed from so many different approaches. For example, one can discuss the anatomy, the prevention, the recognition, the evaluation, the immediate care, or the follow-up care of injuries. Injury data can be divided by sport, by body part, by severity, by type of injury, *etc*. Perhaps the most complicating factor of all is the simple question of how does one define an injury? Because different investigators have chosen different ways to define what constitutes an injury, their findings often appear to be in conflict with one another and in my opinion are often grossly misleading in terms of the magnitude of the injury situation as it actually exists.

Do not mistake what I am saying to imply that there is no problem. To be sure, we do have a problem. As a matter of fact, in my opinion, we have more than one problem. We have, of course, the problem of the injuries themselves, but we have two additional problems that I feel are perhaps even more serious. They are: 1) the example that is being set for our young athletes and 2) the way the media reports the problem of sports injuries. These two problems are in themselves further complicated. The first, the example being set for our young athletes, is complicated by the fact that we can do very little about some of these examples. Many high school hockey players have been given the impression that the most decisive move a player can make in a hockey game is to crush his opponent's skull with his stick. Young football players learned not many weeks ago that the best way to handle a pesty wide-receiver is to have a defensive halfback give him a well placed elbow to the jaw. The whole scene is further complicated by the very real question of what does the general public really want to see in a sports contest. Some evidence of what they want may be found in this quote from a recent issue of *Sports Illustrated* (5:9) "The phrase 'makes the hit'-echoing the mobsters term for murder-is much in vogue. Explosive contact, with the implied promise of caved ribs, gut, head, legs or whatever, is one of the most attractive features of the game for some spectators. Listen to Howard Cosell bleet with ill-conceived excitement after a defensive linesman has coldcocked a quarterback, or a defensive back has all but destroyed a wide-receiver. Brutal contact is one thing pro football is selling, it's what the coach teaches his players to execute with vigor and efficiency . . . " It's bad enough that the example is being set and bad enough that certain segments of our society want to see this kind of behavior, but the ultimate wrong is that some of our high school athletes and YES some of our high school coaches give strong indications that they wish to emulate this kind of behavior.

The second problem that I have added to this complex scene is in my opinion the most significant one of all. I refer here to the way the media handles the problem and will discuss this in some detail in a moment.

Before I discuss what I consider to be some of the major issues and developments in sports safety at the high school level, let me set one or two ground rules. First I have dealt largely, but not exclusively, with the situation as it exists in the State of Wisconsin, since this is the scene with which I am most familiar. Secondly, I have chosen to replace the word, issues, with the word, concerns.

I would like to present what I consider to be four of the most pressing concerns and developments that relate to them.

Concern Number 1

"'Injuries in the high school program are rampant.'' First, let me give you the scene as it is presented by our news media. I will at the same time be addressing myself to the problem I mentioned earlier, that is the manner in which the mass media handles the reporting of the entire injury situation and right along with this the irresponsible remarks made by some individuals who should know better.

From the *Chicago Tribune* (2), Title of the Article — "NFL Injuries Cost Money Too." The article deals primarily with professional football, however, there is little doubt that as the typical reader goes through it, high school programs suffer, if in no other way, from guilt by association. Some excerpts from the article: Quoting the physician from the San Diego Chargers: "By the second or third game of the season, I find everybody is hurt."

Quoting the author of the article "Without radical rules changes, and an equally improbable altering of coach and player attitudes, *American* football will continue to be the world's most injurious team sport. With a casualty rate of 100%." Now all of a sudden, the article is dealing with American football as a whole; it started out dealing with professional football. At one point in the article, the authors used their "freedom of the press" to make comparisons with England's rugby. The comparisons, by the way, were based on the opinions of one British physician.

Again from the *Chicago Tribune* (3), Title: "Annual Epidemic in Prep Football." In spite of this title, over 75% of the article, to be conservative, deals with injury reports and statistics from football at the professional, college and university levels. In addition, many of the quotes regarding what exists at the high school level are, once again, found to be nothing more than the opinion of a single individual.

The *Wisconsin State Journal* (7), Title: "Football: The most Hazardous Sport." Reference is made to 300,000 adult and child injuries requiring emergency treatment every year, as well as about 20 deaths. The article deals with football all the way from the sand lot level up through the professional level. No distinctions are made regarding injury frequency at one level or another.

Now for the granddaddy of them all. *ABC News Close-Up* (1), "Danger in Sports: Paying the Price." Broadcast over the ABC television network on Monday, October 14, 1975, 8:00 to 9:00 p.m. Eastern Standard Time.

The intent of this one hour national broadcast was, to me, suspicious, when I saw the script as published by the American Broadcasting Company. Those of you who saw this travesty may remember the opening quotes.

Opening line from the actual script! Speaking — Jules Bergman. Narrative — "More than 800,000 American youngsters are injured in high school football every year. Why?"

"You are looking inside a damaged human knee . . . One of hundreds of thousands injured each year . . . Of those injured . . . scores of thousands end-up being operated on. Thousands of those are high school football players. No one is sure how many."

"We let our sons play football with equipment that too often is dangerously inadequate. Why?"

but enough of that!!!!

Unfortunately, what the viewing public did not know is that these opening statements, inherently over-dramatized and misleading, all appear on the first page of the script, under the one word heading — "Tease."

If one looks up the definition of the word "tease" in Webster's New Collegiate Dictionary, it reads as follows: "To vex, harass, or irritate by petty requests, or jests and raillery." That last word sent me to another page in the dictionary where I found "raillery — joking ridicule, pleasantry touched with satire, banter." So much for the opening.

I will not bore you with the sensation seeking contents of the balance of the program expect to point out that the title to the next portion of the script in my opinion says it all. There at the top of page 3 is the testimonial to the validity of the entire show. That title: Act I.

The unfortunate thing about all of this is that even though there are numerous valid statistical reports available on sports injuries at various levels and for the various sports, these reports receive very little attention. The reports highlighted by the media are the isolated cases involving the quadriplegic or the death. Ah, but alas! Such is the nature of our "free press."

Yet another very misleading and unfair dimension to all of this is that frequently when one of these articles appears, it is written as if no one cares or is doing anything about athletic injuries.

The net result of all of this is misunderstanding by the general public. This misunderstanding is perhaps best summed-up by the following from *The Forum* in an issue of *Time Magazine* (6), where a reader writes to the editor: "I have a time saving idea. Why don't we speed-up the course of the National Football League's apparent evolution by next year giving all defensive linemen battle axes and maces and all offensive linemen shields and spears, and throw out the football since it only gets in the way. Then sound the trumpets, drop the handkerchief, and cheer the carnage while American football, character and sportsmanship, burn."

Even this observation made by one reader was prompted by an earlier article dealing with professional football, but ended in an indictment of "American football, character and sportsmanship."

If reports of this kind are exaggerated, what are the facts?

The most accurate look I can give you concerns the athletic injury picture in Wisconsin. From the data collected in our insurance program or Benefit Plan, which is conducted by our State Association office, we are able to draw the following conclusions regarding football injuries in Wisconsin public high schools during the 1974 season.

The odds of a high school football player being injured were approximately 16 out of 100. Yes, in the State of Wisconsin, a player's chances of being injured during the 1974 season were approximately one out of six.

But let's look a little closer at this one chance out of six.

The injury a football player was most likely to sustain was a contusion. The next most likely injury was a sprain.

These two categories (hardly serious or permanently disabling injuries) together comprised nearly 75% of the chances of injury of any kind. In other words, the odds of an injury that was more serious than either of these was something less than five out of every one hundred injuries.

To take the remaining categories, only some of which are more serious, the odds were something like this:

Fractures	1 out of every	7 injuries or	
		1 out of every	46 participants
Lacerations	1 out of every	27 injuries or	
		1 out of every	170 participants
Dislocations	1 out of every	44 injuries or	
		1 out of every	283 participants
Contusions	1 out of every	44 injuries or	
		1 out of every	283 participants
Dental Injuries	1 out of every	70 injuries or	
		1 out of every	444 participants
Knee Surgery	1 out of every	74 injuries or	
		1 out of every	478
Abrasions	1 out of every	110 injuries or	
		1 out of every	707 participants

Punctures	1 out of every	220 injuries or 1 out of every	1,414 participants
Burns	1 out of every	4860 injuries or 1 out of every	31,108 participants
Hernia	0 out of every	4860 injuries or 0 out of every	31,108 participants

Don't let me do to you what some of the sensation seekers have done with their statistics. In order for these figures to be meaningful, some explanations are necessary. First of all, what does the Benefit Plan consider an injury? The system includes as an injury any incident that results in a claim being paid by our Benefit Plan. This means the athlete has seen a doctor and a bill has been submitted. Another question that has to be answered is what percentage of our schools and athletes are included in our data base? Slightly over 93% of the public high schools are involved in the Benefit Plan. This involves over 30,000 football players. Because 7% of our schools are not involved, and not all football players are covered by our Benefit Plan, our 30,000 plus data bank represents approximately 85% of the total public high school football players in the state. Unless the injury picture is astronomical in the 15% of the players who are not included in the data, it is relatively safe to assume that our figures are valid for the entire football population.

Are there any possible flaws in these data? Certainly one could theorize that some athletes suffer injuries that should be seen by a doctor but, because their coach is concerned that they will be kept out of competition, they are not sent to the physician. On the other hand, one could also theorize that the number of athletes that go to see a physician is considerably higher than it would be if there were no financial coverage for the doctor's services. The point here is simply that we are not making ourselves vulnerable in Wisconsin by making unwarranted claims on the basis of the data we have. We are reporting factual information from a large data base that seems to be an excellent indicator of certain types of risks involved in the sport of football. Incidentally, these figures were made available to ABC, prior to their telecast, but they chose not to use them.

Remember, these figures are for the injured who see a doctor. What about those who don't see a doctor? Quite honestly — we have no data.

What trends, if any, have we seen in football injuries in Wisconsin over an extended period of years? We have seen virtually no change in the percentage of injuries falling into each of the categories of contusions, sprains, fractures, *etc.* Similarly, we have seen no change in the incidence of injury as related to games versus practice. We have, however, seen a steady decrease in the injury ratio over the past ten years. The 1964 injury ratio was 20.25. The 1974 injury ratio was nearly five full points below this (15.62). Incidentally, this steady decrease in the injury ratio is paralleled by the steady decrease in the number of fatalities per 100,000 participants, as reported by the National Federation of State High School Associations over the same ten year period.

Concern Number 2

Conditions, facilities and services surrounding amateur athletics are poor at best. Developments dealing with this problem include: *Development Number One* — A recent survey including responses from over 82% of the 424 high schools in the State of Wisconsin indicated the following: a) less than 12% of the schools have a specified team physician. If the school has over 1000 students the likelihood of the athletic teams having a specific individual as their team physician is doubled and almost tripled; b) over 55% of the schools have a physician at some of their athletic contests. Those contests are most frequently; football, hockey, wrestling; c) approximately 80% of the schools indicated that they always rely on a physician to determine when an athlete can return to practice or competition; d) 63% of all schools indicated that they do have a set policy regarding immediate first aid in the event of injury; e) far less than 10% of all head coaches have no training of any kind in connection with athletic injuries; f) slightly less than 40% of the schools responding had a student trainer; g) nearly 50% of the schools indicated an interest in hiring a certified trainer within the next two to six years; h) over 70% of the schools have a training room; i) over 63% of the schools have a specified budget for athletic training equipment, supplies, *etc*. j) nearly 60% of the schools do notify a physician in advance of their home contests.

The details of these data incidentally show clearly that the larger the school, the more adequate are the facilities and services.

Development Number Two — The State of New York is in the midst of an extensive experimental program in which athletes, both boys and girls, are placed into competition on the basis of their physical abilities and physiological maturation as opposed to their chronological age and year in school. One of the stated purposes of the program is to determine whether or not such classifications and placement of athletes will reduce the incidence of injuries associated with various sports.

Development Number Three — In Wisconsin as I am sure is the case in most states no individual may participate in interscholastic athletics without the benefit of a thorough medical examination before doing so.

Development Number Four — In Wisconsin as I am sure again in many states we are making extensive use of a Medical Advisory Committee. This Committee made up of nine physicians from across the State of Wisconsin, advises the Executive Staff and Board of Control of the High School Athletic Association on any and all matters that have even the slightest health and safety ramifications. This includes regulations concerning seasons, game rules, conduct of tournaments, physical examinations, *etc*.

Development Number Five — Literature dealing with sports injuries and sports safety could currently fill a small library. To name a few we have, "Coaches Guide to Safe Football," prepared by the National Federation of State High School Associations. "Current Sports Medicine Issues," "Selected Problems in Sports Safety," both published by the ASCSA of the American Alliance for Health, Physical Education and Recreation. "Comments in Sports Medicine" published by the American Medical Association. "The Encyclopedia of Sports Science and Medicine" prepared by the American College of Sports Medicine published by McMillian Company. *The Physician and Sportsmedicine*, a monthly journal published by McGraw Hill Incorporated.

The list goes on and on and includes literally hundreds of publications as well as position statements by such organizations as the American Medical Association, the American Academy of Orthopaedic Surgeons, the American College of Sports Medicine, the National Athletic Trainer's Association and the American Academy of Family Practice.

Development Number Six — In the State of Wisconsin athletic trainers have organized themselves into an association. Admittedly this currently includes primarily trainers at the college level, but will no doubt trickle down into the high school level in a short time.

Development Number Seven — As was indicated in the Wisconsin survey, over 50% of our schools do have a physician present in the sports that are most likely to produce injury. Perhaps the reason that there are still nearly 50% that do not have physicians present is simply the age old problem of not enough M.D.s to go around. I am not sure what the final solution to that problem is unless it is simply to involve paramedics or certified trainers instead of M.D.s. Another route, of course, would be to increase the amount of training that the coach must have to qualify for a position. In Wisconsin with the help of our State Department of Public Instruction we now have a permissive coaches certification program. While our coaches are not required to be certified this is definitely a step in the right direction.

And finally, as far as supervision or guidance from the state athletic association in general are concerned, in Wisconsin, we have had numerous workshops, meetings and publications directed toward the subject of athletic injury and treatment. Last year, we conducted ten workshops throughout the state that were attended by nearly 500 high school coaches representing nearly half of our member schools that dealt with injuries related to sports. Each workshop was conducted by an athletic trainer and a physician. In addition, there have been similar workshops conducted by trainers' organizations, private insurance companies, private physicians, our Athletic Directors' Association, our Coaches' Association, *etc.*

On the national level, there are similar efforts. Examples include meetings of the AMA's Committee on the Medical Aspects of Sports, the NATA and the countless other similarly interested organizations. The private sector has shown its interest through such efforts as the Wilson Sporting Goods Company's film on football safety. Dr. Kenneth S. Clarke, an educator currently at Penn State University has formulated the National Athletic Injury/Illness Reporting System (NAIRS). The United States Government, through its Consumer Product Safety Commission has included in its National Electronic Injury Surveillance System (NEISS), a category in which injuries associated with sports and recreation are tabulated.

I am concerned, however, that there is what could be called a knowledge gap or credibility gap in the area of sports safety. Kelly and Kalenak (4) in a recent article in the *Journal of Sports Medicine* have fairly conclusively documented the existence of such a knowledge gap. Of those coaches that are not physical education teachers the vast majority would probably suffer from an even larger knowledge gap.

The credibility gap that I refer to may be a figment of my own imagination. I do, however, sense as I move around the State of Wisconsin a feeling on the part of the people dealing directly with the athletes that the people from the "Ivory Tower," that is the research people and/or administrative supervisors do not know what they are talking about. Perhaps this is simply the old resistance to change, but whatever it is, it does in my opinion present a significant obstacle to the necessary adaptation of new found information that could help reduce sports injuries. A perfect example of this is the Philadelphia study that shows without question that knee and ankle injuries can be reduced by 50% in football by simply adopting the use of molded sole football shoes. When presented with these data, a significant number of coaches, at least in the State of Wisconsin, chose to ignore the data. We have, however, adopted a rule that will require all schools by 1980 to use only molded soles or soccer style football shoes.

Concern Number Three

Finances may become a factor contributing to unsafe conditions. We have all heard of countless situations across the United States that indicate that the tightening of budgets in every phase of our society including the public schools may have a serious effect on the athletic program and specifically on the quality of safety facilities, equipment and services available to that program. The budget problems are a very real thing. If you don't think they are, check with the citizens of Rockford, Illinois, a community not over 75 miles northwest of Chicago that was forced to drop its entire offering of extra curricular activities including the athletic program effective this year. In my opinion athletic programs can be conducted safely without that dimension causing a significant problem. There are many frills and fancies that could be cut from even the typical high school athletic budget that would have no negative effect on the conditions of safety surrounding that program. To name a few: pre and post game meals, new uniforms every year or even every other year, travel by charter bus instead of school bus and awards programs.

Concern Number Four

The last area of concern that I would mention is that of litigation.

This too, will be discussed later in this conference. I would, therefore, limit my remarks simply to an expression of deep personal concern when I hear of judgments being handed down by the courts in the amount of five million dollars in one single incident.

Conclusions and Recommendations

I personally can come to no other conclusion after having viewed and reviewed the overall sports safety situation as it now exists in this country except to compare it to an explosion in a feather factory. The present approach to the study of this subject shows hundreds of individual efforts moving in their own individualized and uncoordinated directions. Each of these feathers, or efforts, if you will, when viewed individually has a very neat, orderly and precise path it takes in arriving at its destination, but each is such a very small part of the total picture. On the other hand, the view of the total is something less than orderly and is in fact chaotic. Not only are all of the feathers taking their own route, but the mosaic includes feathers from chickens, turkeys, pheasants, pigeons, robins, eagles, and probably a buzzard or two.

As my 15 year old daughter would put it, I suggest that we "get it all together." Certainly all of the answers are not available within that explosion in the feather factory. Many of them, however, are and we have been derelict in our duty and are now paying the price. Unless we "get with it" we may pay an even higher price in the very near future.

Specifically, I would repeat the recommendations I made at the midwinter Executive Committee meeting of the National Federation of State High School Associations in Portland Oregon on January 6, 1976.

If we really believe we have something good going here in athletics, including the game of football, as intelligent people we should be able to see that there are threats to its existence as we now know it, and should be able to do something to reduce or eliminate those threats. In view of the ominous rumblings coming from legislators, the mass media and certain influential individuals and in spite of the fact that more often than not these rumblings emanate from misleading or misinterpreted information, it is my opinion that some agency should formulate a task force to deal with this problem. Being a bit presumptuous and in the great American tradition of acronyms, I would suggest that the Committee's name be C-I-D-S, pronounced "KIDS" and standing for "Committee on Injury Data and Safety." Whether CIDS is a Committee of its own, or otherwise organized, is of little consequence.

What I am about to recommend is somewhat specific. Let's not lose the war or even a battle because of a nail. If there are details best added, deleted or altered in the recommendation, so be it. But, I feel strongly we must begin NOW! We can nit pick later if necessary.

I would recommend that the Committee on Injury Data and Safety (CIDS), comprised of selected knowledgeable individuals, be formulated to discuss the situation in depth and that the Committee be given the following specific charges.

1. Meet as soon as possible and on an ongoing basis.
2. Construct a schema for defining sports injuries in a meaningful way.
3. Construct appropriate data collection tools.
4. Construct a system that will gather accurate and meaningful data on athletic injuries of all types, in all sports, and at specific program levels.
5. Provide for the analysis and interpretation of the data collected.
6. Make these data and findings, along with recommendations, available to appropriate rules committees as well as equipment manufacturers.
7. Assist the sponsoring agency with the immediate implementation of an aggressive campaign to:
   a. Disseminate information regarding the Committee and its functions.
   b. Disseminate information developed through the work of the Committee in an effort to insure that legislators, the mass media and the general public receive a fair and accurate description of conditions as they exist.

To continue as we have in the past, we can at best expect a *status quo* situation. That is, we can continue to hear outbursts from the mass media and others regarding our lack of concern and lack of action to improve the situation. We, in turn, can continue to be defensive whenever attacked. At the worst, we can expect a dramatic increase in action in two areas. The first is litigation. Our courts will become more and more crowded with lawsuits involving sports injuries. The second is legislation. Such legislation may be somewhat unpalatable to many of us in the business of athletic administration!

I am being somewhat selfish — I need this system just described to answer the questions put to me by; administrators, coaches, parents and athletes! What's available now does not give me the opportunity to give intelligent and convincing answers to the questions that are being asked.

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Ed Mileff presiding at session on equipment standards. Voigt Hodgson seated on left and Bill Hulse on right.

The Program for Girls and Women

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The recent expansion of girls and women's sports programs in the schools has resulted in many changes in program organization and school and public philosophy about the female and athletics. The trend within the high schools consists of local league competition culminating in district and state championships. Intercollegiate competition includes local leagues, state and interstate (regional) competitions culminating in national tournaments in almost a dozen sports. More and more women are actively pursuing a degree or educational specialization in athletics, specifically in coaching, administration, sports news broadcasting, and athletic training. More monies are being made available to finance the women's and girls' programs. The recruitment of high school girls for college teams and the awarding of scholarships are increasing. All high school athletic stars can probably expect to be contacted by at least one school interested in her potential for an athletic scholarship.

Concomitant with this increased competition and larger number of competitors is an increased interest by the mass media. This may be due in part to the improved quality of performance, but most likely is due to the advent of TITLE IX and the realization that girls and women deserve or will demand equality of coverage. Public interest and concern is at a new high and the commercial capitalization on this interest is astronomical.

I believe that these developments of enhanced sports opportunities for girls and women, the drive for equality and the attainment of the male model of sport may cause those in athletics for the female to ignore basic safety issues. With this in mind, I have chosen to discuss seven basic sport safety issues connected with the status and future direction of girls and women's sports. Other persons might state these issues in other ways or group them differently. I have chosen to present the basic issues in the form of questions similar to the way a coach or administrator might pose the questions.

The seven issues will be discussed separately in the following pages, but are listed prior to discussion:

1. What are safe lengths of seasons, number of games per week, and adequate conditioning for female athletes?
2. How should competition be grouped: coed, age or size of participants, size of school, etc.?
3. What constitutes safe equipment and facilities?
4. In which sports and under which conditions are special protective devices required, and what should be the standards for these devices?
5. Do the rules of the sport promote safe play?
6. Are the kinetic aspects of movement patterns dangerous enough to exceed human tolerances?
7. What should be the qualifications and functions of coaches, trainers, medical personnel,

officials, and administrators so that safe sports programs for girls and women can be maintained?

What are safe lengths of seasons, number of games per week, and adequate conditioning for female athletes?

Increased emphasis on winning, recruitment and athletic scholarships have led to longer seasons and more games per week for the female athletes. NAGWS, AIAW, and other girls' and women's sports associations have written philosophical statements and policies concerning the length of season and number of games per week and per day. Pressures, however, to get more competitive experience and therefore to change these policies are great. As it is, women tend to play more contests per two-day period than do many male teams. Possibly this is a carry over from the days when lack of financing necessitated "making every trip count".

There is inadequate physiological research to indicate the safe time intervals between contests. Different athletes respond differently to the same stresses of a contest. Individuals are at different levels of conditioning and recover at different rates. Recall, for example, Olympic competitors who have won all the long distance events of a particular year, a woman who earned three gold medals in track events spanning three days, and another person who earned seven gold medals in swimming events. It would be very difficult for us to say what the specific limits of a particular person are at this time.

Concerning physiological stress, one must ask the question: How much conditioning is necessary for girls and women to participate in certain prescribed lengths of contests and seasons? Similar to the past history in male sports, many women have been "all stars" in all sports. They finished one competitive season and went immediately into the next sport. There was little in the way of specific conditioning. The natural skill and fitness levels of the athletes were assumed to be adequate for the start of the season. Now, however, there is evidence to indicate that contests are being lost by the team which is not adequately conditioned physiologically to perform at high speeds and/or for long durations. This may be the reason for the prevalence of new conditioning programs, new publications concerned with conditioning of women's teams, and of single season sports performers.

The answer to the question of frequency of competition may well rest in other areas. Research into biorhythms of female athletes suggests further need to evaluate the relationship of biorhythms and sports performances. In addition, there is concern for the mental health or safety of women who are competitive athletes and full-time students. There is also concern for the male athlete and his student status.

Efforts are being made to plan scientifically the optimum lengths of seasons, the most appropriate conditioning programs and other factors for optimum preparation of each athlete for competition. There are two aspects, however, which need more research: (a) to what extent will the athlete be conditioned for later life, the post-athletics period, if single sport emphasis becomes the pattern; and (b) to what extent have the requirements for the sport been adequately assessed. This latter point will be discussed under a subsequent topic.

How should competition be grouped: coed, age or size of participants, size of school, etc.?

This is an area in which much precedent exists and some research has been ignored. Sports for males have been highly organized for many years. There are groupings according to age, school size, and weight classifications. The trend in sports programs for girls and women is to utilize the traditional male model. From a biomechanical research and safety point of view, sports should be equally safe for all participants. Therefore, competition should be based upon height, weight, lean body weight, or physiological age of athletes or combinations of these factors. In some sports, forces and energies to be absorbed by the athlete's body are dependent upon forces and energies imparted by the opponents. Bearing this in mind, is the traditional, more convenient method of grouping athletes the best method from the standpoint of the safety of the athletes in all sports or is a new model necessary?

What constitutes safe equipment and facilities?

Women coaches, athletes and administrators are demanding the best or highest priced equipment, or equipment comparable to that of the men. There are two directions that I believe these individuals must take in the future. They must demand that manufacturers; a) design clothing which allows perspiration to evaporate, b) use fabrics which resist tearing, c) develop specific shoes for specific playing surfaces so that the shoe-surface interface will be safe, d) make equipment which is virtually unbreakable, e) use colors which facilitate response of perceptual processes to "fast play", and f) investigate a multitude of other safe designing schemes. Secondly, the athletic personnel must evaluate constantly the new equipment and its effect on the various aspects of the sport. They must become aware of the role of the ASTM Committee on Sports Equipment and Facilities and utilize its findings.

In which sports and under which conditions are special protective devices required, and what should be the standards for these devices?

Traditionally, girls and women have shown less concern for, or have ignored the existence of, a need for special protective equipment. Exceptions are eye glasses guards and field hockey shin guards, as well as those body protectors specified by the rules of softball, fencing and goal keeping type sports. The use of mouth protectors, wrappings, knee pads, heel cups, etc. have been minimal. The present women coaches "grew up" without many protective devices. They didn't need them; why would today's female athletes need them? The issue is compounded by the fact that advertising of many of the protective devices includes lists of benefits so long that they appear to even "cure the common cold". Coaches are skeptical.

The approach that I would propose is that women coaches become involved in the research process. Data must be collected with respect to the possible dangers to the female athlete, the requirements for protective devices, and possible litigations which could ensue should these devices not be worn. Data from the NAIRS data bank, coupled with biomechanical research, may provide information needed to relate causes of injuries to lack of special protective devices. Conferences involving researchers, lawyers and athletic personnel should be planned, so that instances of undue risk to the athlete will be decreased.

Do the rules of the sport promote safe play?

The National Association of Girls and Women's Sports, NAGWS (formerly DGWS, NSGWA,etc.) has had a long history of rules construction, evaluation, and modification. The organization has usually been criticized for being too conservative, which in essence kept the game "too safe" for the participants. The motto of the organization has been "for the good of those who play". Today there is increased pressure for NAGWS to participate in the standardization of rules, either adopting comparable rules used by men or adopting international rules. These pressures reflect the possible new role of girls and women's school sport programs for the preparation of professional and Olympic competitors. How will these pressures for such a role, change the philosophy of sports for females? This seems to me to be the major danger to the safety aspects of sports. Will the philosophy of winning alter the manner of play? The sports rules for males are inundated with penalty clauses as a result of participants' deliberate circumvention of rules and perhaps even deliberate attempts to injure opponents. We see evidence of these actions appearing in women's sports competition. This suggests, then, that research is needed which can predict the future philosophy of sport for girls and women in our society and thereby provide guidance in the modification of sport rules before unsafe conditions occur, rather than after they occur.

Are the kinetic aspects of movement patterns dangerous enough to exceed human tolerances?

Since athletic injuries occur in situations where all safety precautions have been taken with respect to medical examinations, equipment, facilities, protective devices, and equality of competition, this raises the question of human tolerances. Are we exceeding the limits of the human body; for example, exceeding the strength of bone, muscle, ligaments and tendons, or exceeding the ability of the nervous system to control and regulate interplay of muscular activity? Possibly the answer lies in the conduct of more research concerning the forces and moments which need to be withstood by the body and then the design of comparable conditioning activities. Further, possibly the answer can be found in the identification of psychological responses to the competitive stress and their effects upon the control of muscular activity. Whatever the reason, coaches must be cognizant of these possibilities as they present new techniques for performance, or improve an athlete's performance to such an extent that acceleration rates cause high increases in forces and stresses upon the athlete's body.

What should be the qualifications and functions of coaches, trainers, medical personnel, officials, and administrators in order to maintain safe sports programs for girls and women?

This question would be answered if all the problems discussed under the first six basic safety issues were solved. One of the primary functions of the coaches, health care and administration personnel is to make sports safe for the female athlete. From this general statement, I would like to restrict my remarks in this discussion to what might be termed priority qualifications and functions. Other speakers at this conference have elaborated on many of the responsibilities of athletic personnel. Therefore, I will not repeat their comments except as I view them as priority needs for the women's program.

The primary qualification of athletic personnel should be knowledge of anatomy, physiology, biomechanics, and sports medicine topics. I believe that, although the women coaches on the average have had a better background and more interest in these areas than have the men in athletics, the women are still ill-prepared to meet the challenges of sports programs for girls and women. However, as evidenced by the leadership in the Association of Intercollegiate Athletics for Women (AIAW) and NAGWS there is evidence that women athletic administrators agree that these knowledges are important qualifications for athletic personnel, especially the coaches. Hopefully this will become a required qualification, and not remain on the optional list, as sports maybe take on a greater urgency in winning and greater public concern.

The other particular priority qualification I would state is that some of the leadership personnel or some of the athletic coaches and administrators should be women. Now, I am not saying this purely as a women's libber, but I say to you that if the men that are available, have a background as athletic trainers primarily in the football area, are they any more qualified than women who have experienced many types of competition, to actually serve in a capacity with tennis and basketball teams? Women who know a little bit about what kinds of things happen, because they have been through the program.

In addition, sometimes the philosophy differs between a particular male coach and a particular women's athletic department. When a person who is going to coach a men's team happens to be a woman, that woman has to see things from the viewpoint of the male, so to speak. If she is going to coach fencing, she has to learn how to fence the saber, and the epee as well as the foil. She needs to fence against men. She needs to be able to watch the males in competition, she needs to get a sense of a feel of the style and the kinds of things that are happening. Therefore, at this point we probably need to make sure that some of the women are still taking the leadership roles in the women sport's world so that they will be able to continue to build athletics for girls and women without experiencing a vast demarkation in philosophy.

Conclusion.

These seven issues of sports safety resolve themselves into one question: Do there have to be sports injuries: physical or mental? It is not enough to copy the male model; since that model has not solved all the safety problems and there has been an over emphasis on safety in football. Rather, in those instances where answers have been found through the history of male sports programs, we need to determine whether or not these answers can be applied to the female programs. If so, they should be applied. If not, a search for new approaches must be made. The whole question of sports safety must be studied cooperatively by those interested in sports. Efforts of the sponsoring agencies of this conference, and groups involved with the Joint Commission on Safety and Competitive Safeguards in Sports need to expand with other organizations. The NAGWS Research Committee might place greater emphasis upon encouragement of research, specifically in sports safety. Their forthcoming publication, NAGWS RESEARCH REPORTS VOLUME III will contain several articles related to this topic.

Safety is safety, the principles are the same although the specifics will differ with respect to the sport, level of skill or style of play, and environment of play. Those in athletics must take action to instigate a scientific approach to analyzing safety aspects of sport. Possibly the model for evaluating sport safety in field hockey, appearing in the new safety of sports publication from AAHPER, might provide a model for use in all sports. Using this model one can identify the participants, the environment and possible unsafe factors. One then plans the research design to determine possible causes and ways to alleviate the unsafe factors or practices. Implementation of a plan of action to reduce the unsafe situation is the next step. The final step is to evaluate the effectiveness of the plan.

Athletic personnel must direct the development, recognize the issues and determine the best way to make sports safe for girls and women.

The Recreational Programs

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The recreational programs of which I am about to speak range from team competition to individual accomplishment; from hard hitting contact sports to passive pursuits. Fifteen years of recreational administration and coaching are combined with extensive National Safety Council (NSC) desk and field work in forming my opinions and the following perspective.

National Safety Council Recreational Safety Program

Within the National Safety Council's structure, recreational safety responsibilities are coordinated from the Public Safety Department which is within the newly created Community Safety Resources Group. Virtually all occupational and non-occupational departments within the Council and constituents of the Council utilize recreational safety programs and services of NSC.

To date, the National Safety Council's recreational safety programs, projects and services have been quite diversified. Aquatic activities include research on attitudes regarding personal flotation devices, inspection of state and federal recreational areas, participation on the Consumer Product Safety Commission/National Swimming Pool Institute's Swimming Pool Slide Standard Development Committee, work on a study to determine safe diving depths, publication of several new aquatic safety books and recently, the establishment of a repository of boating safety educational materials. Additionally, members of NSC staff have served on committees of allied organizations including the Council for National Cooperation in Aquatics, National Swimming Pool Foundation, National Association of State Boating Law Administrators, National Safe Boating Council, International Swimming Hall of Fame, and others.

In snowmobile safety, NSC staff is serving on the Snowmobile Safety and Certification Committee, compiling and publishing an annual national summary of snowmobile related accident statistics, and currently we are working on a safety guide. Camping, off-road recreational vehicles and shooting activities are closely monitored. In addition, we've maintained an active interest in the National Athletic Injury/Illness Reporting System of Penn State University and the NEISS program of the Consumer Product Safety Commission. A Recreational Safety Newsletter is published and sent monthly to member and non-member subscribers.

The Council's Public Safety Conference membership of 75 men and women volunteers hail from 23 states and Canada. These professionals represent many areas including education, industry, business, government, medicine, law enforcement and public service agencies. The Conference members serve the National Safety Council as consultants and advisors for specific accident countermeasure program identification, development and implementation. Certain sub-publics have been singled out for concerted efforts. People involved in water, camping, shooting, winter and off-road recreational vehicle leisure and sporting activities now have the benefit of Conference Standing Committee action.

Committee deliberations and considerations include: selection, use, maintenance, storage and proper disposal of products; techniques and qualities of activity supervision; effective facility security; voluntary and mandatory performance standards for merchandise; personal protective apparel and equipment; rules and traditions that govern activity conduct; enforcement policies and procedures; environmental and economic impact, and facility design. The Public Safety Conference activities also incorporate cooperative efforts with the other Conferences of the Council. In this regard, Congress programs are jointly planned and presented annually by Conference members.

Many Have a Stake in Sports Safety

It was not until I left coaching that I fully realized the extent to which non-teachers had extensive commitments to sports safety. I've recently met with doctors, lawyers, manufacturers, distributors, legislators, statisticians, researchers, journalists and many others who have deep concerns for the safety of the participants. It may seem unusual to just recently discover many of the studies, programs and conferences being conducted throughout the country that directly affect participant performance in recreational activities in which I was so closely involved. But, after careful examination and discussions with former coaching colleagues, I find that this is not an unusual situation. Coaches meet mostly with other coaches, doctors attend meetings with other doctors, manufacturers meet with other manufacturers, and so on. The end result is that the recreational participants, the persons who would benefit the most from application of the latest information, never receive it.

Scarcity of time and travel funds are common impediments to periodic inter-professional meetings. But, communication difficulties that inhibit technical understanding between two or more professions may be a stronger reason for infrequent contacts. I know that when the National Swimming Pool Institute (NSPI)/Consumer Product Safety Commission Swimming Pool Slide Standard Development Committee met, we were fortunate to have as project coordinator, Mr. Larry Paulick of NSPI, a man who has an engineering background *and* the skills to interpret engineering and manufacturing concepts to people from other professions. Medical, legal and recreational concepts were also continually being explained as required. Our positive progress as a heterogeneous committee of consumers, doctors, physicists, engineers, manufacturers, lawyers, human factors experts, researchers, journalists, educators, and others was directly attributable to continuous efforts at inter-professional interpretation. In fact, the most extensive deliberations were about decisions relative to water depths and swimming pool slide placement. Final decisions for the standard were based on a combination of scientific principles and mathematical calculations as they applied to expected human behavior. These decisions could not have been equitably established unilaterally. The same type of interpretive efforts are important at future meetings of multi-professional groups.

Present Recreational Programs

Recreational programs and accompanying safety factors are complex. They are interrelationships of people, products, facilities, environments, attitudes, and traditions. They are combinations of physiological, psychological, kinesiological and all the other . . . .ological factors. Current school, park district, city and private recreational programs are more popular than ever. These programs are, for the most part, excellent in conveying to the participants basic skills required to qualify people as beginners. However, most sports and recreation programs fall short of acceptability in two related areas. First, many of the programs do not provide the incentive for participants to acquire advanced training and knowledge. The attrition rate is high after completion of an introductory or beginner's course. The second prevalent program shortcoming is the lack of time devoted to teaching students how to recognize conditions that contribute to accident frequency and severity. Too often these are matters that require full explanation and discussion, but are often dismissed as "common sense" items not worthy of attention. Educators can assist students in risk recognition and recommend means by which risk can be minimized as desired. Note that I'm not advocating elimination of all risks from recreational activities. There are apparently many people who participate in certain activities because of the associated risks and the benefits derived from challenging adversity. Recent popularity of skateboarding, hang gliding, parachuting, hot dog skiing, and similar activities is not attributed to the absence of risk or accident potential. Some of these sports participants have a very explicit safety message that simply says, "Don't go any higher than you're willing to fall."

Recreational Programs and Special Considerations

Recreational program administrators and others concerned with sports safety should address some of the problems that may not ordinarily be associated with sports or recreational activities sponsored by a school, park district or city. A problem that has not been precisely defined but that is generally recognized is the role that alcohol ingestion plays in accident frequency and severity. Few studies to date have been directed toward determining just what effects alcohol consumption in various quantities influences judgments, skills and reactions similar to those required in recreational boating, snowmobiling, swimming, camping, hunting, and other activities. Some people have suggested that blood alcohol concentration tests applicable to motor vehicle operators on highways may be similarly applicable to people participating in recreational activities. While the tests may be appropriate, no studies have been completed that show effects of alcohol consumption on skills required to safely operate a recreational vehicle or to safely participate in specific recreational activities.

Some attempts to study alcohol ingestion relationships to recreational activities have encountered major difficulties. Plans to test or even survey participants have been delayed or cancelled because some agencies have disallowed any authority or jurisdiction to test individuals or groups at recreational sites. Coroners and medical examiners have reported the blood alcohol concentration percentages found in drowning victims (1).

But, because of incompleteness and the non-random selection of cases for testing, this information does not pinpoint the proportion of drownings involving alcohol. However, the figures do indicate that alcohol is a factor in a large number of drownings. For those jurisdictions that reported details, about one-third of the victims tested had a blood alcohol concentration greater than 0.10% and would have been considered legally intoxicated. It is obvious that more research and educational efforts are needed in this regard.

While recreational equipment and facility designs are being evaluated, the supervision of participants and security of facilities require special consideration. The quality and quantity of supervisors and instructors is being severely challenged. This is particularly true immediately following a serious injury. This controversy continues in youth sports programs, high school sports programs, city swimming pools and even federal lands where camping, hiking, and climbing are popular. Yet to be established are precise qualifications for being a lifeguard, a supervisor of playgrounds, or a volunteer coach of little league type teams. Illinois has a relatively new law that says every public swimming pool must be supervised during all open hours. While this is a giant step in the right direction, the qualifications of the pool supervisor need clarification.

Security of facilities is of increasing concern to owners and operators. School, park and city budgets are being over taxed in efforts to patrol, fence or otherwise make secure public recreational grounds and associated equipment, especially during "off-hours." Informational and educational programs can include messages that would assist in reducing trespass and other unauthorized use of recreational facilities and equipment.

Conclusion

Sometimes sports participants do not clearly understand the scientific approach to technique development of safety systems. I recall a baseball clinic I attended a few years back. Some of the good thinkers within the baseball coaching ranks were in attendance. Scientific presentations were made regarding hitting stance, hand positions and velocity of the curve and fast ball. The hitting star of the Chicago Cubs was on the panel of experts, and he was asked to give details that would account for his phenomenal hitting success. Well, the coaches and researchers were poised with pen and paper ready, for this was the highlight of the conference. The batting champion was going to divulge his hitting secrets. The batting star picked up a bat and said, "I grab my favorite bat, get comfortable in the batter's box, and when a good pitch comes in, I *whoosh* it."

The coaches and research people didn't quite know how to interpret this explanation. The batting champion explained that he had tried several of the proposed, scientifically sound methods of bat swinging but that his batting average suffered for the efforts. He then went back to the way he had first learned to swing — *whooshing* it. I believe that most recreational participants do things in a manner that is consistent with early experiences. Therefore, recreational programs for youngsters and young adults must establish sound scientific principles for safety as well as for skill development progressions.

Formal competitive sports programs are responsible for most of the new equipment and facility development; protective equipment innovations; officiating and supervisory techniques; product design changes; and, performance characteristics. Informal recreational activity participants are ordinarily quick in adopting these changes for their own use. The exception to this rule is in the use of safety related equipment. The recreationalist has, in some locations or jurisdictions, a choice. Competitive skiers, motorcycle riders, snowmobile drivers, water skiers, and boat operators wear protective gear. Recreational participants in the same activities are not bound by rules to do likewise. Granted, risk levels may not be similar, but there is plenty of injury data to support the voluntary use of protective devices for the non-competitor. On the other hand, some highly developed equipment used in competitive sport may not be appropriate for use by the casual participant. These are the types of considerations that must be addressed by conferences such as this, and the resulting decisions must be passed on to the sports and recreation participants through educational programs.

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Question and Answer Period

Question #1. (Comment) Something came up concerning athletics in New York State. I just want to alert you to a New York State law that already has taken effect. This law requires that all coaches have a first-aid background. There is a grandfather clause for coaches who are currently in service but they have to complete a first-aid course within a specified number of months. I don't know if any other states have this type of requirement, but this is something that has taken effect in New York State.

Harris: I have found that many coaches who I have worked with have a very sound first-aid background but little or no time to apply it.

Question #2. I certainly appreciated hearing how much safer the Wisconsin survey shows in relation to what was getting very undoubtedly confusing. I hope that the sort of information presented to this group gets as much publicity as some of the others. I wonder if you have any figures that show approximate injuries or cost of hospitalization per hour of involvement in the high school football program or any program in relation to the comparable risks of those same kids just cruising the streets in their cars?

Herrmann: We do not have those figures available but they could be generated rather easily if one were to take the statistics that are made available regarding swimming, picnicking and that sort of thing and compare them to our figures. The last report of that kind that I recall was done by Clarke in the sixties, I believe in 1967, in the *Journal American Medical Association*. I think they'd still be pretty good. They'd probably have to have some slight adjustments but you're right. I think man-hour participation in certain things again in terms of very severe injuries and deaths, showed that you are safer to be out for high school sports than to be out walking the streets or driving a car. But in terms of abrasions, contusions, and sprains and that sort of thing, you probably are not as safe.

Question #3. In one of the earlier articles from the North Carolina study by Blyth and Mueller, there were comparisons of injury frequencies reported in a number of studies, some of the studies being insurance record studies and others being on-the-field reports. I recall the particular article in the *JAMA*, about 1970 or 1971, the insurance studies ran at about 50% incidences compared to that of the on-the-field (sort of totals). Is that a pretty reasonable guess from your perception of the data from Wisconsin? Please comment.

Herrmann: Do I understand you right, 50% less?

Reply: Well the insurance data seemed to run somewhere in the neighborhood of 15-20 hundredths injury per participant year and the on-the-field studies of football at least, ran somewhere in the neighborhood of ½ incident per player a year. Working figures varied a little from one study to another. That seemed to be the difference between the reportable through insurance and reportable by trainer, studies on that kind of approach.

Herrmann: I think that's fairly accurate. That brings me to one of the reports that I was going to mention. I think it was very prominently mentioned in the ABC *travesty*. I have a hard time calling that program anything else. One of the studies that was done by a very reputable individual trying to get athletic trainers out into the field, reported something like an 80% likelihood of your child being hurt in football. That's the way it was translated by ABC. And that study as I understand it, the way the data were gathered, was conducted with a lot of athletic trainers right there on the scene. So everytime a kid had an "Oowie" he went over and signed the report as an injury. And that extrapolated by ABC, etc., as meaning there's an 80% chance your child is going to get hurt, and mother always hears that in terms of 80% chance of death or quadraplegia. That's the problem.

We had another one by a very reputable individual that X-rayed the cervical spines of incoming freshmen of a major university and showed that most of them, as I recall, had permanent damage of one degree or another to their neck. That was touted at our national football meeting as reason to take the face mask off of the helmet. This man had X-rayed a number of music majors also, and found no comparable damages. But what I guess people failed to realize until it was pointed out was that the sample of people that had the neck damage was a biased sample. They were the "studs" from the high school programs who were given a scholarship to that university because that's the way they played football. That is why they were given a scholarship, because they used their heads. They rammed with it, butted with it, blocked with it and so there's no way that data should be used to imply that 80% of the high school athletes in our football programs come out with comparable damage. It's just fallacious, that the kind of publicity, and when I said there are some people who should know better than to throw those kinds of statistics out, I guess that's one of the people that I am talking about.

Question #4. What is the philosophy of using bio-chemical methods for growing the prime athlete? I have been reading in the papers that some foreign countries use anabolic steroids to develop fine athletes.

Adrian: I think that throughout our nation, European countries, Asia, South American countries, and other nations the use of anabolic steroids or other kinds of drugs both for males and females to try to improve performance is a concern to those people who are either researchers or persons who are not the actual coaches, themselves. To my knowledge, the women in this country have expressed concern. There are instances where people suspect that maybe girls or women in our country are going to be having hormone injections of some sort. Most of the women say they would condemn this. We think this should not be. We conducted a survey of our coaches and physical educators to find out what they knew and see what is prevalent. It was found that most women coaches and physical educators really don't know too much about drugs, about what's going on with the drug scene, and most of them at least up to where we started talking about these things in the last ten years, say, "Oh! this can't be happening." Well, I think that the coaches now are aware of the problems, they still do not have the education. There is still a feeling philosophically in the women sports organizations that this is wrong, That this should not occur. Philosophically, that is all I can say.

Question #5. (Follow-up) The steroids, etc., are used as an official means of pepping things up, but in an article that I read not too long ago about the Russian method of injecting a very massive dose of red corpuscles to use more oxygen. Can you answer that?

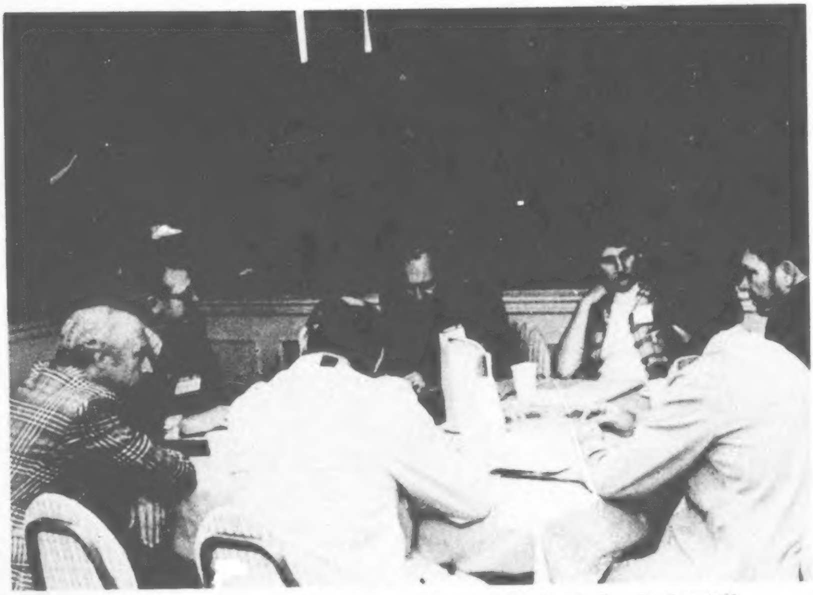
(Dr. Ryan was requested to respond)

Ryan: I just spent the last two days in Phoenix, Arizona, at a conference put on by the sports medicine committee of the AAU. I spent a great deal of time during the two days with Dr. Marder, who is now working in West Germany, but up until a year ago, had been working with the East German sports program. And so, of course, he was very familiar with everything that has been done there and he did confirm the fact that they had been using anabolic steroids in the training of young athletes. But just to indicate what their ignorance about this is, even if anabolic steroids were effective in improving performances which they are not, and which we have demonstrated conclusively that they do nothing for the athlete, it's very hard to sell this to athletes and coaches because they want to believe in magical aides. But even if they were effective, the doses and the times that they were using them, according to his account, would have done nothing actually to help the athlete one way or the other. I also found out he was totally ignorant of what the adverse effects of the administering these steroids over time would be, either to young persons or adults. There was also some reference made to blood doping, which is what you are asking about, and which was a technique which was developed simply as a laboratory experiment by Gunnar Eckblom in Sweden some years ago and reported by him, as a very uncontrolled experiment done simply as a laboratory test. Subsequently, however, Eckblom has become enchanted with this idea and has been doing some experimenting with Swedish athletes. I talked to him in Quebec City in July. I listened to a presentation of his figures which weren't worth the powder to blow them up. In the meantime, Dr. Williams at Old Dominion University in Virginia has done a beautifully controlled study on this technique of a blood doping and demonstrated conclusively, in a well controlled series, that there is absolutely no benefit from doing it. At the meeting in Phoenix, Arizona, the first session that Dr. Marder presented, was opened to everybody who was present at the meeting. It was a room that was as big as this room would be if it were extended all the way down to the East Towers suite (Note: about 200 feet). It was packed with people. He discussed many things about the program and the way they organized the program. When it came to the question period, three-quarters of the time was taken up by people who kept consistently questioning him about this steriod business. They were mostly swimming coaches, and that is what they were there to hear about. Their belief in magic dies *hard*, and anything which comes from Eastern Europe or darkest Africa or the basin of the Amazon will go over big. People want to know about it and they are tremendously impressed by it.

Sports science in this country today is as strong as any country in the world. Sports science in Russia is about as weak as in any country in Europe. The East Germans have no respect for it at all. And yet, the minute that an announcement appears in the paper that the Russians have a new device for developing muscle by stimulating electrically, everybody is calling up and want to know where they can get this device. So if you are associated with athletes and working in the sports situation as most of you are, you should be used to the fact by this time that anything exotic or magical and so forth is going to be appealing. But before you place any credence in it all, you want to look at it very closely, just as Dr. Allman said last night, with regard to another matter. Read and study and so forth, before you swallow it whole, just as we used to say when you heard somebody getting off on something that he was just talking of the top of his head or that he heard around the corner, it's all war stories.

Question #6. My point is Sir, how can your fine explanation get the same type of press as the other does?

Ryan: We get press but, unfortunately, the tendency is for people to read into things what they want to see and to pay much more attention to any claim which is sensational. Any claim which says the result is negative or no value, gets very little attention. They don't want to believe it. I have had people actually quote to me from articles saying that this article proves such and such a thing, and what the article said, if you went back and read it, was the opposite of what they said it proved.



Round table discussion — "Education and Supervision for Safety in Sports"

Round Table Discussion
Safety Concerns in Recreational Sports

Robert Kirk
University of Tennessee
Knoxville

Moderator: During the last five or six years, the University of Tennessee at Knoxville has done a great deal of contract research on some recreational activities. One of the major ones that comes to mind was a contract to survey our national parks. This was a major piece of research concerning how people were being injured and killed. It also dealt with the transportation system and the entire situation at the major national parks. That material is available, but I wish that one of the individuals who had worked on that project had been able to come this morning and briefly share with you some of the major findings. The second significant piece of research they're doing involves a preliminary report on bicycle safety, which is a major problem as far as recreational activity is concerned. I don't know if there's any research being done on snowmobiles or not. I haven't seen anything in that area. That seems to be the sort of thrust that the research department at Tennessee is beginning to take which seems to be consistent with the ideas of Casey Clark, who stated that we need more than just the statistics. We need some input concerning a lot of various factors relative to how the accidents, injuries, and deaths occur.

Here is some information from the Consumer Products Safety Commission concerning what it has done and what it has on file related to a few select analyses or studies on various safety aspects of recreation. This one in baseball, the activity and the equipment, is a summer report. We did get copies of that, some of these others are somewhat out of date. It was interesting to me at least to see some of the things revealed in these reports. Obviously, as far as collecting data, this is a rather restricted sample even for the Consumer Products Safety Commission. You just don't get that kind of standardized reporting.

Question: Do these reports have recommendations for rule changes that could be implemented in order to minimize injuries in sports?

Moderator: These specific ones do not have; however, there are publications that do include some recommendations. You remember yesterday when Casey Clarke talked about doing some sort of an ad hoc retrieval for purposes of recommendations. The recommendations are primarily for the benefit of the Commission for hearings and so forth, but are available when and if they do make recommendations.

Statement: The Commission has what it calls fact sheets. They are general recommendations that specify rule changes that would probably reduce the frequency and severity of injuries. We have a whole series of these.

Question: Who makes the decision concerning what would be a good rule change?

Response: It should come from a meeting or meetings with the Product Safety Commission people. There are many groups; that's one of the problems. There's the NCAA, the AAU, NAIA, the High School Federation, the Consumer Product Safety Commission, the Baseball Coaches Association, the Football Coaches Association and so forth. Each organization has its own recommendations. The rules we use for our intramural sports are basically the NCAA rules except we modify them because we don't have NCAA quality competitors. Each year we revise them, based on our experiences from the previous year. They have been the same for the last five years, but we still have people that get hurt probably because they don't know what to do or the situation exists where they just can't prevent themselves from being injured. What I was trying to point out, was that the best rules for recreational sports are not necessarily those for high school or college sports.

Question: Are there any specific suggestions concerning what rules could be modified or eliminated?

Response: There are no national suggestions or standards for rules. Each area adapts the rules to the requirements of their participants and their facilities. I know of no general suggestions to modify rules to fit a certain situation.

Moderator: Frequently you will find state departments of public health take a lot of suggestions that are available from many agencies and make certain suggestions and publish those as recommendations within the state on a state by state basis.

Statement: I have found that in most areas there are some knowledgeable people who are playing softball or whatever the activity. A meeting of those leaders within the activity can often provide a great deal more input into the most feasible modifications of rules than somebody sitting on the 15tn floor of an office building. That's usually pretty much how it is done. The people that are in charge in our situation will see that one person sets up the schedule for the whole season. He will have three or more people who are pretty knowledgeable about playing softball and they are the ones who change the rules from year to year. They look over accident patterns from the last few years and say, well! We have a problem here. How can we modify it to relieve the problem. This is generally a lot more effective than taking somebody's standard a thousand miles away and trying to apply it to a specific situation.

Moderator: I have been brainstorming a few of my friends who say they are recreation specialists. I have asked the question, what do you perceive to be some of the major problems; that is, the safety problems of recreational activities? The one thing that comes through over and over again is the ignorance or the misunderstanding relative to the use of things that they're working or playing with, such as snowmobiles, skis, bicycles, motorcycles, or swimming pools. The swimming pool is a classic example. In other words, as a private individual, I have enough money and enough space on my lot, so I put in a swimming pool, even though as the head of the household, I may not know how to swim. Everybody else in the community seems to be putting in swimming pools, so I'll put one in too. The construction company for the pool may not be concerned with the safety features that should be a part of every swimming pool. Or, my son comes to me wanting a motorcycle. We go to the motorcycle shop and buy the bike. The son has probably ridden somebody else's bike, it's not a major means of transportation; it's a recreational vehicle. These are the types of problems that the recreational specialists claim are the major ones. So what I conclude from all of this is that a lot of fatalities or near fatal accidents occur simply because people do not know how to use the things that they're expected to get pleasure from. They don't know how to use them in a situation in which they're pretty much controlling the circumstances.

Response: I think that to be able to get the kind of support that you need to fund the programs that involve training or education, you've got to be able to show what the causes of accidents are or the absence of precautions. In my line of business, we are constantly trying to identify one of three things as the causative factor. Is it the machine, the environment in which individuals are operating the machines, or is it the person himself? Frankly I can't remember the exact statistics that have been accumulated on the snowmobile fatalities. But, of course the vast majority of the statistics that we do get from the various jurisdictions, states and provinces in North America have to do with injuries only, and they are usually extremely poor for a multitude of reasons. Therefore, if I am trying to convince a state legislator that he's got to put up some money to fund a program to teach kids in high school, snowmobile driver education if you will. I haven't got a strong enough argument. I can't compete with somebody who wants to expand the driver education program because he's got a better statistical base from which he can argue.

Moderator: From an insurance standpoint, if you had a comprehensive study program on the snowmobile, would the insurance companies give you a discount?

Response: Yes they do. There are states that require children or people under sixteen to have accident insurance and with that they get a break in insurance.

Moderator: Taking your point from my experience related to driver education. This is a biased view, I guess. I would conclude that for many years it may not even have been the statistics *per se* but the insurance actuary that people are using.

Response: Insurance companies are going to do this, other organizations are going to do that, so what do I get out of these kinds of sessions from which I might draw general conclusions concerning these organizational efforts? However, I do agree with you that they can be drawn together into a more unified effort.

Moderator: One of the major items for consideration, not at this meeting but at the main meeting of The National Safety Congress, has to do with uniform accident and injury reporting. The reporting which is most confusing right now obviously is the OCSHA reporting system, which includes a lot of the related things that we're talking about at this particular Conference. There is a proposal that will be considered at the National Safety Congress designed to at least appeal to the federal government, to unify the reporting of accidental injuries and thefts. In other words, the Council has the same concern as you have; but as it has already been noted, there are so many other different groups who have their own schemes and have developed these and spent many, many hours as if to say that mine is better than yours. I think that most feel the same way, that the data are so scattered. Even more important, we have no system to deliver organized interpretations even if we had some standardized system for getting to the people who fill out the forms, whether they're in an emergency room or in a plant first aid station, law enforcement people, *etc.* So it's the human factor again; even if we had the system, how do we get it down to a one-to-one basis? This is very important. And when you initiate, when you identify what it is, when you write the report, give us enough information so that this information when analyzed provides us with a broad enough data base that we know what we're talking about, and that will then allow us to develop programs. So I think that it's a national problem and obviously you're voicing it. It certainly is a concern of the National Safety Council because as has been stated, everybody has a recording system and after a while it's very much like reports coming to your desk. You begin setting priorities.

Statement: There's a brand new course, education of trainers at Northwestern School of Medicine. It prepares individuals to become athletic trainers. It's a very extensive course.

Moderator: I'd like to go back to your observation from the Virginia public school system. You mentioned education. I'm a great believer in parent action, someone recognizing the need. You know probably better than I, that most school systems do what parents want done, at least what a significant number of local parents feels needs to be done, if they can afford it. So if they wanted a top medical care program in that state the parents could push it. I would say that it is not so much an educational endeavor, but a parent action. Frequently, people will say that we need to educate parents. If we search and investigate a situation, we often find that a state athletic association will have a regulation that says that a physician shall be present or a certified trainer shall be present. The "blinders come down" unless someone says, well, let's follow this thing through. It all goes back to whether or not people on the local level care. If you go back a year or two, you'll find that there were one or two people who cared about the programs on the playgrounds. This is the reason that this kind of situation exists on your playgrounds, in terms of the caliber of the personnel who work on these playgrounds, even though they may be volunteers. It is the standards developed at the local level.

Response: In some areas the parents are becoming less vocal. In Rockford, Illinois, they have no athletic or recreational program in their high schools, because of the failure of a bond issue. It's the lack of money. The parents of the athletes are very vocal but they can't out talk the concern for the lack of money. Those are the kinds of implications that I'm worried about. What's going to happen to the recreational development or lack of recreational activities for all these kids? I think the biggest base for recreation is the school system.

Moderator: You're saying what seems quite obvious throughout the country. When you have problems in the school, you tend to cut off the activities the kids enjoy the most, but which are not part of the three R's. So that's the lever. If you don't approve the bond issue, we can't have intramural sports or after school sports, we have to stick to the basics; English, math, social studies, language, and basic academic program. So if we, as parents, don't pass the bond issue, the school system can justify this course of action in terms of dollars and cents.

Question: How do you decide in the snowmobile industry what you would distribute in the way of safety information for the purchaser of a snowmobile?

Response: We have developed in conjunction with state administrators and The National Safety Council and other official organizations a series of documents that we distribute and use to get the message of safety across. The first is a handbook of 35 to 40 pages at the most that we send all over the country to individuals who may request it. The manufacturers are now putting the booklet itself into the package of warranty with all the administrative matter that accompanies the product as it goes to the user. So they get the message this way. Of equal significance, is an operator's training handbook which has been prepared. It is very extensive covering some 150 to 200 pages. It tells an official how to set up a training program, not necessarily for children but it's oriented toward children since most jurisdictions have laws requesting training for the youthful operator. Again it was developed through the same sources, experience, people looking at statistics, etc. It's a very detailed document that even includes lesson plans. That's the second method we use to get the educational message across. This is as far as our efforts have gone up to this time. These efforts are considerable I've found, compared to other industries. Some of the people have picked up aspects of safety education and publicized them rather than put them back in the closet as some types of industries have done. A relatively new approach is to grab safety problems right by the horns and deal with them right away.

Moderator: I'm not asking for a public comparison, but in other words you would conclude therefore that this industry is ahead of the motorcycle industry. I'm speaking in terms of the moment of purchase.

Response: There was an industrial conference that I went to where safety aspects were brought up and they said that we cannot talk safety because we'll lose customers. I'll tell which industry it was. It was the swimming pool industry. This was not a person speaking for the industry as a whole, but for his company. It was not off the record; it was in a meeting of 500 people. He said you cannot sell safety when you are selling swimming pools so don't bring it up. He said something to the effect that we do not mention safety in the brochures that we give the people when they are considering buying our pools. When they start thinking of safety, they're not going to buy pools, at least not from us. I think some of the people in that industry have done a good job, but the industry as a whole has been slow in coming around. Some of the motorcycle people have done a super job on safety programs. I know Kawasaki and some of the others have programs available. They also sponsor citywide programs and have developed safety films. It all goes back to where does the money come from. I think in almost all industries, the industry itself is more than willing to put up a reasonable share of the money, when they're convinced that it's going to improve sales. If they decide to do something, they would rather do it themselves and get it done faster and cheaper. I recognize the reluctance of the manufacturers to sell safety because it does cost. It results in a mark-up. There are those that feel that you can overdo safety price-wise. When you start talking about real money in the snowmobile industry, you're talking about trail development for snowmobiles which entails the leasing of land and the like. As far as injuries when using the snowmobile are concerned, when comparing them to the injuries in our intramural sports, most of the injuries happen because the people are out of condition.

Response: I've never been snowmobiling so I can't speak from experience, as far as snowmobiling is concerned. My only question then, is there any kind of conditioning program that you would recommend before the sport season begins to minimize pulled muscles? There are a lot of injuries that are not reported and will probably never show up on any surveys. That was brought up yesterday in the speech on the football program. Without a doubt many participants are lazy and won't do conditioning work and programs. You can have the best program there is geared to the people participating in it but if they won't do the conditioning program, then what good is it.

Question: I agree, but what if there are those who are willing to condition themselves for a snowmobile season or a softball season, are there program outlines available?

Response: Once again there are no statistical data to consult to see what conditioning programs should be instituted. But the goals of conditioning programs may consist of power, strength, flexibility, and endurance. If you have these qualities, then you are less likely to be hurt.

Moderator: In some of your major sports, do you have things such as exercise physiology instruction or anything of that sort as a part of your industrial programs?

Response: Some industries do but our particular one does not. All of these intramural sports are set up in a social, competitive atmosphere and it's nearly as structured as a high school or collegiate program as far as coaches and trainers are concerned. But still, the people are Tuesday night athletes who come out once a week to participate, and that's one of the major problems.

NOCSAE: A Program to Reduce Serious Injuries in Athletics

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Introduction

The National Operating Committee on Standards for Athletic Equipment (NOCSAE) was organized in 1969 with the following membership: the American College Health Association (ACHA), Sporting Goods Manufacturer's Association (SGMA), National Athletic Trainer's Association (NATA), National Collegiate Athletic Association (NCAA), National Federation of State High School Associations (NFSHSA), National Junior College Athletic Association (NJCAA), the Sports Foundation of America, and more recently the National Athletic Equipment Reconditioners Association (NAERA).

The purpose of NOCSAE is to reduce injuries by formulating standards to which athletic equipment must conform. Head injury in football was given the highest priority because of the numbers of serious injuries and the potential for improvement. The Department of Neurosurgery at Wayne State University was selected to develop a football helmet standard and research began in 1971.

Football Helmet Impact Standard

There are a number of considerations that must be made in setting a standard. Some of the more important ones are as follows:

Types and incidence of injuries. First, one must think of what type of injury you are trying to prevent. In football, as far as closed head injuries are concerned, the two main ones are concussion and cerebral vascular injuries. Something is known about concussions and these are the most numerous. Secondly, not too much is known about cerebral vascular injuries, the most common of which are the subdural hematomas. These are the head injuries that result in fatalities and paralyzing conditions. One must also consider what a standard might do to other injuries in terms of the neck of the player wearing the helmet and in terms of injuries to other players. The tolerance levels of these internal injuries and where should the standard be set in relation to them must be considered.

Available materials. The state of the art of the materials and the methods of fabrication must be considered because one can't just arbitrarily set the standard too high, so it is impossible to meet the criteria.

Impact environment. One has to think of the impact environment; at what velocities are these heads traveling and what are the stopping distances involved? What kind of surfaces are the players running into? What is the effect of temperature, etc.?

Head model. If a standard is developed, it should be based on a realistic head model. Something to which human tolerance standards can be applied and something that will not cause unrealistic damage to a helmet.

Performance. The level to set the performance standards or the performance criterion of a helmet is also important. To what level should a helmet attenuate accelerations of the head? This is very critical. This can be set at various points because it's related to the state of the art.

Failure criteria. What in addition to the accelerations above the maximum tolerable G-level should be used as a failure criteria? In other words, should failed rivets, cracked shells, damaged liners, etc. be considered as failures?

The test method. How comprehensive should a test method be? How many locations should be struck? How many times? What environmental conditions should be simulated?

Comfort. This is a very important factor. A coach called me the other day. He said they had 11 concussions at their school this fall, including a paralyzing injury last Friday night. Since they used certified helmets, I was very concerned. I invited him to Wayne State to test the helmet. He brought the exact helmet that the boy was wearing when he was injured. The boy had cut out the front of the energy absorbing part of the liner, a two-inch swatch from top to bottom down the front. It is not known if that's where he had his injury, but the coach was asked if he had seen any others like that and he said that his own son had cut his out. So, it could be it's the coaches fault for not being more careful and not being more knowledgeable but it could be that there are not enough shell sizes. This boy had a 7¾ head perhaps oval oblong and he was looking for comfort. He was the best athlete they had and they were going to get him in some kind of helmet, one way or another.

Sizes. How many sizes should be tested to make sure that the whole size range of the manufacturers is as safe as they can be.

Equipment. The test equipment used must not be so sensitive that it can only be used in the laboratory where there are people who have worked with it. It must be rugged and repeatable and must be accurate. An attempt is now being made to evaluate the NOCSAE equipment on a larger scale than ever before. Some special helmets have been made up and are being used in a round robin test now in conjunction with ASTM.

Duration. Duration of certification of helmets. How long should it be? A year? 10 years? Nobody has been quite sure of that but it's a question that must be asked and also answered.

The cost. Is a standard going to put some schools out of the football business? This must be a consideration, since some helmets are already costing $50.00 a piece.

Recertification. Is it possible to help schools keep their costs down by recertifying helmets after they have been once certified? I'll go into a little more detail on this, because it is currently being done.

Enforcement. The best standard in the world isn't going to work unless some kind of a system is developed whereby it can be assured that the helmets turned out by the manufacturers are going to maintain the same quality at which they were originally certified and, furthermore, that helmets on the field are being maintained in that quality by the equipment people.

These are some of the considerations that should be taken into account. I'll provide more details on some of them.

Injury Incidence and Human Tolerance

A study of high school football injuries in the Chapel Hill, North Carolina area by Blyth and Mueller (2) showed that the most frequently injured parts of the body were: the knee (19.3%); ankle (15.3%); head and neck (8.8% — head [6.2%] and neck [2.6%]); shoulder (7.3%); upper leg (5.4%); back (4.7%); and injury to other parts of the body trailing off at lower percentages. While not the most numerous, head and neck injuries are obviously the most serious injuries incurred in football. The most common head injury in this study was a cerebral concussion, projected across the nation to be 75,000 annually in high school play.

The football fatality study by Blyth and Arnold, (1) conducted since 1931, shows that the average 19-20 deaths which occur annually for all levels of play, head and neck accounted for about 80%. The fatal incidence has fluctuated between 1 and 2 per 100,000 participants, with cerebral hemorrhage being the most common cause. From the above evidence it can be concluded that either concussions and the rare cerebral vascular injuries occur from different mechanisms, or that it is a matter of force intensity, with concussions usually occurring at the lowest levels among most individuals. Occasionally acute cerebral hemorrhagic injuries occur without post-traumatic unconsciousness associated with concussions.

A recent cerebrovascular disease report (5) showed that among males of football playing age in the United States, the disease incidence is between 1 and 2 per 100,000, about 70% of which are hemorrhagic. Even granting that active young men drawn into football may be atypical of the population, it is very doubtful that any practical protective headgear can completely eliminate cerebrovascular injuries in football.

The only tolerable design limit available relates the likelihood of cerebral concussion and the time history of linear acceleration experienced by the head. Furthermore, it is the only limit for which practical instrumentation is available with which to assess the hazard of an impact to a head model wearing a helmet. Based upon the evidence of Gadd, (3), a Severity Index (SI) of 1500 was chosen as the performance limit which should not be exceeded by the head model in a standard impact test. The SI is defined as follows:

$$SI = \int_0^t A^{2.5}\,dt \leq 1500$$

where A = linear acceleration in g's

2.5 = a weighting factor

dt = a time interval

t = pulse duration, $0.0025 < t < 0.050$ sec

It is assumed the design to minimize the SI will provide a protective umbrella for all types of internal injury.

Head Model

Since the 1500 SI performance standard is related to clinical studies, human cadaver drops and volunteer air bag impacts, it is essential that it be used on a head model which is as realistic as possible. Several years of prototypes led to the present head models. Sizes 6⅝, 7¼, and 7⅝ are presently in use evaluating the impact attenuation characteristic of football helmets. The head models have 50th percentile dimensions in each of these three sizes derived from U.S. Army head anthropometry data. These are the critical head sizes (smallest standoff from the shell) in each of the three shell sizes used by most manufacturers. The head models also have weight, mass distribution and impact response characteristics similar to the human head as determined from comparison with cadaver impacts. The response of the head model is determined by a triaxial accelerometer mounted at the center of gravity of the head. The 6⅝ head model in its test fixture is shown in Figure 1. There are now 27 such test devices in use in this country, including seven by manufacturers, sixteen by reconditioners, and four by institutions.

Test Method Consideration

A study of films in which football head injuries occurred showed that the most likely impact surfaces to produce head injury are relatively stiff, such as another helmet, knee, foot, turf, or elbow. While it is not possible to accurately determine the kinetics involved, such as forces and accelerations, the injuries appear to occur in the 17-25 feet per second range of velocity changes. Impacts to the entire area of the shell are possible. The front is the most critical from the standpoint of head shape, prominence and helmet strength. The side shows 20% less tolerance in the monkey and the possibility that a rear impact may have even less tolerance (4). The helmet designer can achieve maximum attentuation for a top impact. There is some controversy as to where to specify impact in the region of the temple and in the occipital area. Some claim that the shell should be cut high in back to prevent a so-called guillotining effect against the back of the neck by the shell rim (6), but critical injuries have been reported from

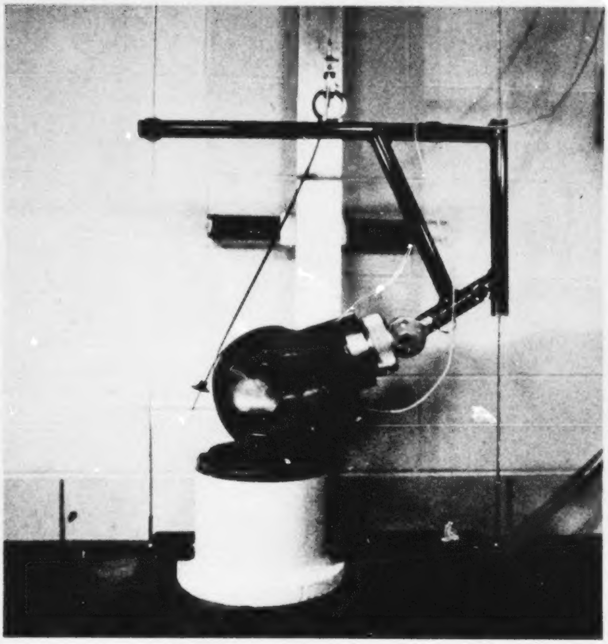

Figure 1. NOCSAE size 6⅝ head model in football helmet drop test fixture.

rear blows to the neck (7). Similar arguments are given for temple exposure versus field of vision. Another consideration is that football helmets must be able to take repetitive impacts, but fixing the number, location, and time interval between tests is somewhat of an arbitrary decision.

The Standard specifies two drops at ambient temperature from a 60-inch height (17.9 ft/sec) at each of six locations on the head with two additional lower intensity impacts at front and side to observe response trends. Two drops are also required from 60 inches onto the front corner of the helmet after exposure for at least four hours to each of the following extreme conditions: -20° F, 120° F, and submerged in water.

A firm rubber pad ½-inch thick and 6-inch in diameter, mounted on a rigid metal anvil is used as the impact surface. Multiple strand stainless steel ⅛-inch flexible cables, maintained at 190 pounds tension, are used to guide the carriage on which the head model is positioned. The wires serve the purpose of guiding the head model to hit on the impact location, and to yield enough to relieve stresses in the head and carriage due to the bending action caused by most impacts being eccentric to the CG of the drop assembly. The result is an impact followed by a rolling action with little rebound, similar to a gridder hitting the turf with his head.

For a standard to be effective, the electronics, and the mechanics of the system must be accurate, repeatable, reproducible, easy to operate, durable and allow fast operation, *i.e.*, its utility in new manufacturing and helmet reconditioning plants as a quality control tool is probably more important to the standard than its use in research development. Consequently, every effort has been made to keep the mechanics simple and durable and eliminate as much human error as possible. The Severity Index is electronically calculated from the output of the three acceleration axes of the accelerometer mounted at the CG of the head model, and is presented in digital form.

Table 1
Comparison of Certified and Pre-certified Helmets Severity Index Performance for the Standard Second 60-Inch Right Frontal Boss Drop

Average of Certified Models		Pre-certified Helmets Tested as Received by Reconditioner					
Severity Index*	866	Below 1199	1200-1499	1450-1999	2000-2499	2500-2900	Total
Number	63	58	80	411	274	26	849
Percentage	—	6.8	9.4	48.4	32.3	3.1	100
				- - - - - - - 83.8% - - - - - - -			

*Severity Index must not exceed 1500 on second drop from 60 inch for certification.

Effect of the Standard

As shown in Table 1, the effect of the Standard has been to produce certified helmets capable of reducing the SI well below pre-Standard helmet performance. To achieve this change, manufacturers have resorted to size adjustments, *i.e.*, moving sizes in which the head was too close to the shell into *larger shells* or eliminating some larger sizes, and making materials and design changes. Most models had to sacrifice some range of fit and comfort, because stopping the head model from a velocity of 17.9 ft/sec in less than an inch means that more of the space between head and shell must be taken up by higher density and *stiffer liners*. A few models have had to increase shell thickness to prevent cracking around rivet holes due to excessive flexure and provide more support for the liner. This also leads to *increased shell weight and stiffness*, thus creating a more dangerous situation for opponents.

The Standard has not been made more stringent since its inception in September, 1973 because: 1) Within limitations of present materials and fabricating techniques, it would force helmet design in the direction italicized above; 2) There are not enough certified helmets yet in the field; 3) Changes have a delaying effect on school conversion to certified helmets; 4) We are in a learning process and it is not obvious how head-neck injury will be effected; and 5) The present minimum Standard permits a greater range of cost and design for the various levels of play and for injury incidence monitoring by epidemiologists, thus leading to safer helmets.

Expense

To date the cost of research leading to the Standard has been trivial and there has been no cost for enforcement. Slight increases in cost are to be expected, *e.g.*, higher density energy absorbing foam is more expensive than low density comfort foams. Hopefully, whatever new helmet purchase and maintenance increases are incurred because of the Standard will be offset by lower incidence of injury and less litigation and insurance costs.

Length of Certification

It is uncertain how long a helmet will stay in certified condition because of variations in durability among models and differences in numbers and intensities of hits as a result of use. As a direct result of the NOCSAE Standard, the National Athletic Equipment Reconditioners Association (NAERA) was formed and all the NAERA members have NOCSAE test equipment for quality control purposes. The NAERA members do a partial non-destructive test on a small sample of each school's helmets coming for reconditioning after the season. Information from the sample test is carried over to all other helmets being processed. The tests are done on all models and primarily in the known critical locations for each model, but with occasional changes to other impact locations. On the basis of results of these tests and visual inspection, the NAERA members recertify previously certified helmets in obviously good condition and work in cooperation with the manufacturers in restoring damaged certified helmets. How long the helmets will stay in recertifiable condition depends primarily on the type of shell and care with which face masks are installed, because a cracked shell will eliminate a helmet from recertification under present conditions. Many recertified helmets are now entering their third season with performance either undiminished or in recertified condition due to parts replacement.

Injury Reduction

It is still too early to tell the effect of the Standard on head injury in football through equipment changes. The certified helmets are not required in college until 1978 and in high school until the 1980 season. However, the effort has already rendered a valuable service by exploring the extent to which equipment can go towards safeguarding the heads of football players. NOCSAE was very influential in helping to bring about the rule changes that prohibit initial head contact and which may again restore the helmet to its proper role of a protective shield against an unintentional impact.

Neck Injury

There appears to have been an upsurge in serious neck injury in recent years, although national statistics are unavailable (8). Many things have been blamed, such as overemphasis on the use of the head in blocking and tackling, helmet and face mask design, mechanical training devices, mismatches in age, size, training, experience, *etc*. Regardless of the reasons, and while it is hoped that the rules changes will reduce the hazard in intensity and exposure of the neck, circumstances can easily arise inadvertently in which a player's neck is required to absorb more energy within a given time span than its strength can take. The problem is that presently the mechanisms of neck injury are uncertain and consequently, design of equipment to protect the neck and still allow performance is thwarted.

NOCSAE researchers are working with a known injuring surface in the form of a mechanical blocking and tackling device which has caused serious neck injury. Using instrumented cadavers on this device in conjunction with a primate accelerator for use with instrumented anesthetized monkeys monitored with a high speed camera, oscillograms and flash X-ray equipment during impact, it is hoped to evaluate present devices and, if possible, develop better equipment.

Baseball Helmet Standards

NOCSAE has appointed a task force comprised of a coach, National Federation of State High School Association (NFSHSA) representative, a National Junior College Athletic Association (NJCAA) representative, a manufacturer, and the NOCSAE Principal Investigator. A large group of helmets has been received from the manufacturers and preliminary tests are being conducted to evaluate the state of the art of head protection from the chief hazards of the ball and bat in baseball. Preliminary standards will be proposed at the January, 1977 NOCSAE semi-annual meeting. It is possible that in 1977 a voluntary standard for baseball caps will be published.

Hockey Helmet Standards

A representative group of helmets has been obtained from manufacturers in both the United States and Canada and preliminary evaluation of the state of the art of head impact protection from hazards of a fall to the ice, boards, puck, and hockey stick are being evaluated. NOCSAE is working in conjunction with other organizations such as Canadian Standards Association, Amateur Hockey Association of the United States, and the American Society for Testing and Materials to assure broad base of input and support for its standards.

Other Sports Equipment

Because of limitations in time and numbers of personnel, NOCSAE, rather than spread itself too thin, has concentrated on the development of standards to reduce the most serious injuries in sports, which are head and neck. It has as its goal however, establishment of voluntary standards for all sports equipment according to priorities in terms of numbers and seriousness of injuries.

Conclusions

1. The impact attenuation performances of most NOCSAE certified football helmets on the market have been greatly improved (Table 1) relative to linear head acceleration concussion tolerance levels, and are confidently expected to reduce the numbers of concussions.
2. It is less certain whether the helmets will reduce the relatively fewer but often fatal cerebrovascular injuries.
3. In today's concept of helmet design, the factors which improve laboratory impact performance are increased size, weight, and stiffness, all of which tend to adversely affect either performance, neck injury, or injury to other players.
4. NOCSAE impact standards for other sports such as baseball and hockey are in preliminary stages and should be published in 1977 and 1978, respectively.

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ASTM — F-8 Committee on Sports Equipment and Facilities

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ASTM
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When I came here I didn't know whether I would be hearing technical presentations or administrative-philosophical types of presentations. I did have the advantage of hearing what some of the previous speakers have said and I made a few notes. One of the things that struck me was that a blanket organization is needed to attack this problem of sports safety in a multidisciplinary way. If it's one thing that ASTM is, it's a blanket type of organization.

We have all kinds of members and in over a 100 different professional disciplines. I can name toxicologists, agronomists, pathologists, chemists, biologists, followed by lawyers, educators orthopaedic surgeons, you name it, we've got it.

First, I am going to give you a somewhat philosophical presentation about the voluntary standard system in the United States and how it could help you with your complex problem. Permit me to read to you the ASTM scope.

ASTM is a non-profit cooperation formed for the development of standards on characteristics and performance of materials, products, systems and services, and the promotion of related knowledge. In ASTM terminology standards include: test methods, definitions, recommended practices, classifications, and specifications.

Now if we look at what some of the previous speakers have said. There seems to be at least two or three ways to look at the problem of sport safety, it either being litigation or legislation vs. the status quo. There is another way and that's the ASTM way, the voluntary consensus way. We believe that if you gather all the alternatives and all those concerned in essence all the interested parties around the standards developing table, with all of their biases, (we want you to bring your biases) then you arrive at a consensus of how to solve the problem as followed by the time tested regulations developed by ASTM over the past 78 years.

Now, the problem with your problem is, that somehow we have to get away from standards a little bit and get into the problem. We added to our charter in 1971, systems and services, ASTM had always standardized materials starting with A-1 on steel in 1898 on up until 1962 when, with Dr. Lissner of Wayne State, we formed the Surgical Implant Committee for orthopaedic surgeons to write standards for surgical implants. They have been successful in writing over 30 or 40 standards. So now we are looking at systems which we can define as products that are put-together and services. We have only written one or two service-type standards. We're not even sure how to define what we mean by a service. It could be as a service to the American public in the sports and safety community. We could put this problem in the nebulous area of service and then could under our catch-all phrase of the promotion of related knowledge serve as the forum or the umbrella organization to gather all of you together.

ASTM does have the power to convene. In fact, last week as you'll learn when I get into my formal presentation, we successfully convened about 20 female athletes or women involved in this type of problem to form a new subcommittee under Committee F-8. They chose a woman chairman, a woman secretary and will soon be working on the development of standards for protective equipment for women's sports.

What I'm saying in these introductory remarks is that, in summary, ASTM's consensus system is available for national problems. Bill Cavanagh, Managing Director, is going around the country saying this very same thing. He's going to government, he's going before Congressional Committees. It's a new approach. Let's not have the adversary situation of lawyers against lawyers, making laws and fighting each other in the courts to solve our problems. Let's try to do it a different way. So this is a suggestion like some of the others. ASTM is available. We have had the F-8 Committee on Sports Equipment and Facilities since 1969. They have written approximately seven or eight standards and have a lot more in the pipeline.

Now let me get into some of my formal remarks, so you can learn a little bit more about the standards system. Before we tackle the structure of *ASTM Committee F-8 on Protective Equipment and Facilities* it is necessary to understand the voluntary consensus standards system in the United States and the philosophy and purpose of ASTM.

An easy way to do this, is to relate ASTM to the game of football. The game of football is built on standards: the ball is a standard size with standard markings; the referee uses standard rules and standard signals when he issues penalties; the players' uniforms are made to standard designs. Every human activity, from football to diplomacy, is subject to standards of some kind, if only standard definitions to assure clear, concise communication.

Where do standards come from? Nearly as many sources as there are activities. Football rules come from the National Collegiate Athletic Association (NCAA) and the National Federation of State High School Associations, (NFSHSA), and Amateur Athletic Leagues (such as Pop Warner), Local Building Codes (Standards), regulations from government, ethical standards for lawyers from bar associations, etc.

The most prolific single source of standards in the United States is ASTM, over 5,700 of them published in 47 separate books. Standards are designed to tell us what characteristics we should expect from a material, a product, a system, or a service. Standard test methods tell us how to measure certain characteristics and standard specifications tell us how to define these characteristics and describe performance.

The game of standards-writing in ASTM is done by teams of producers and users who wish to develop rules (standard specifications) for buying and selling a material or product. This is a voluntary effort, as individuals are on the team only because of their own self-interest. The effort is also called a "consensus effort" since no standard is finally approved unless it has the agreement (90%) of the majority of interested producers and users. What is ASTM's role in this game: ASTM provides the stadium, the rule book, the referee, and the scorekeeper.

In the case of Committee F-8, the players are the manufacturers of the equipment (Riddell, Wilson, Rawlings, Marietta, Monsanto *etc.*) and the users or representatives of the general public interest who have a stake in seeing that the game is honest. These players are football coaches, football trainers, football team physicians, research scientists from sports institutes, government safety engineers and university administrators and professors.

The ASTM stadium is physically the national four story headquarters building in Philadelphia (180 paid employees). It is also an intellectual forum (Committee F-8, 264 members strong), who meet for away games anyplace in the nation for two large 2-day games twice a year.

The rule book used is the "Regulations Governing ASTM Technical Committees." These rules ensure that ASTM standards will represent the consensus of all interested parties. One rule requires that Committee F-8 must be balanced, so that the producers do not exceed the non-producers of the sports equipment under consideration. Another rule states that the Chairman cannot be employed by a producer. Hence F-8's First Chairman was Dr. Creighton

Hale, President of Little League Baseball. Our present Chairman is your own Professor Morehouse, of Penn State University.

The rule book guarantees fair play and earns for ASTM standards their world-renowned integrity and credibility, and has done so for 77 years. The rule book is the principal reason why ASTM is the world's largest non-governmental standards-writing body. Bear in mind, that the standards game is played six days a week by over 1500 subcommittees, representing over 126 industries or areas of expertise.

The referee who can blow the whistle for an infraction of the rule book, is the ASTM Board of Directors and its subsidiary, the Committee on Standards. The members of this watch-dog committee do not wear referee shirts but they do operate in full view of the players and the American public. Their deliberations are open to public scrutiny.

We now come to the scorekeeper of the game. As Staff Manager for Committee F-8, I stand on the sideline as an expert observer, holding the rule book open to the appropriate page, maintaining a watch over the roster of players, issuing the programs, distributing play strategy, watching the official time clock, keeping track of ground gained, first downs, and penalties and helping to keep the fans all over the world in touch with the progress of the game. I shoulder the burden of the mechanical details of the game plan so that the players can concentrate on the game.

From time to time as scorekeeper, I advise the coaches (Officers of F-8) and the players on tactics, and encourage and motivate the players. One thing I am not permitted to do, is carry the ball; which means voting, or deciding what change shall be made in the game plan.

The stars of the F-8 standards game are the 264 player members of F-8. These volunteers are producing standards that affect the entire sports community. When all the interested parties are in the game, the action is lively and skillful, and the final score represents a true consensus of all those having a stake in the outcome.

What is the price of admission to the ASTM F-8 standards game? It takes $6,000,000 a year to maintain the ASTM stadium and its employees. Most of this cost comes from the sale of the final product: the 47 volume Annual Book of ASTM Standards. The remainder is supplied by the players themselves in the form of a nominal administrative annual fee ($35 for 1977). They get a free book with their own standards in and a subscription to the ASTM magazine.

At first glance, it may seem unreasonable that the players should be assessed a fee for participating in the game. However, they are the greatest beneficiaries of the game — they become the most knowledgeable, the most skilled, and the best informed. Those who sit on the sidelines never really develop the same sure grasp of the problems as those in the game.

In most other countries of the world, the government organizes the standards game, pays all the expenses, and calls the plays. In the United States, government and industry in our system of free enterprise, play the game as equals in the ASTM stadium for the benefit of the entire nation.

Now that I have planted the seeds of understanding with you, by using the analogy of a football game, I want to water the sprouts with some ASTM philosophy and some legal aspects.

The word "Consensus" is a key word and is the prime difference between a NOCSAE Standard and an ASTM voluntary consensus standard. As of this month, October, 1976, ASTM F-8 has promulgated only one standard relating to football helmets and that is ASTM F-429, Method of Test for Shock Attenuation Characteristics of Protective Headgear for Football, and backed up by interlaboratory test data from seven laboratories, none of which are owned by a football helmet manufacturer. This is not a criticism of manufacturer's laboratories, as many ASTM tests have their precision and accuracy validated by a round robin conducted solely by producers. NOCSAE has published a performance requirement with an accompanying test method for its helmet standard with a value stated which the standard implies may relate to the protection against head injury and based mainly upon the state of the art of one university's research and laboratory.

ASTM hereby defines a consensus standard as follows: "A consensus standard is a standard produced by a body selected, organized, and conducted in accordance with the procedural standards of *due process*. in standards-development practice a consensus is achieved when substantial agreement is reached by concerned interests according to the judgement of a *duly appointed review authority*."

ASTM believes consensus implies much more than the concept of a simple majority but not necessarily unanimity, which often can be achieved only by compromises that reduce the quality of the standard. The present rule book makes it mandatory for 90% affirmatives, minimum, to achieve final approval by the duly appointed review body, the Committee on Standards, nine members appointed from the membership-at-large of 23,000 and who serve a three-year term.

What does ASTM mean by Due Process? Eight points have to be followed. At the most, if we were to compare NOCSAE with ASTM, NOCSAE could probably meet three.

1. Timely and adequate notice of a proposed standard undertaking to all persons likely to be materially affected by it.
2. Opportunity of all affected interests to participate in the deliberations, discussions, and decisions concerned both with procedural and substantive matters.
3. Maintenance of adequate records of discussions and decisions.
4. Timely publication and distribution of minutes of meetings of main and subcommittees.
5. Adequate notice of proposed actions.
6. Meticulously maintained records of drafts of a proposed standard, proposed amendments, action on amendments and final promulgation of the standard.
7. Timely and full reports on results of balloting.
8. Careful attention to minority opinions throughout the process.

The duly appointed review authority, our Committee on Standards, together with the regulations, sets requirements for F-8 Committee organization and operation, balance of committee membership, voting and public review, and the consideration of negative votes and appeals. Some protagonists have questioned whether consensus procedures, which by nature are quite democratic, can be an adequate basis for safety and health standards. ASTM believes that its definition of consensus standards is flexible enough that it can be made to work in this situation as well as in others, but acknowledges that the duly appointed review authority may have to establish somewhat different procedures and requirements to ensure this.

General acceptance of the ASTM definition of a consensus standard should also help dispel some of the worries that standards developed by the voluntary system restrict competition, innovation, and customer choice. The standards produced are for voluntary use. They do not have to be used by anyone. The voluntary standards system is capable of producing standards especially for mandatory use if it is given proper guidance by the governmental authority that wants the standard and indeed is sitting at the standards table providing its input along with all other interested parties. This is the case with Committee F-8. Government agencies which are members include the *Consumer Product Safety Commission*, the *National Bureau of Standards*, the *U.S. Army Natick Laboratories* and *Ft. Rucker* and the *Federal Highway Traffic Safety Administration* of the Department of Transportation.

From the legal standpoint it is interesting to note that a 1971 report from the Stanford Research Institute, appraising the impact of antitrust and liability legislation on standards development, predicted that, within several years, "many organizations will be hard pressed to demonstrate that their standards are arrived at in a truly representative manner. Litigation will force some to abandon their standards activities, while others will elect to join forces to achieve a broader consensus."

That day is here. It is a matter of public record in the Cleveland District Court of Ohio that the Dungard Company has filed an antitrust suit against the Riddell Corporation. The NOCSAE standard is cited in the action. With this background let us look at the structure of Committee F-8 and its subcommittees.

The reorganization of F-8 two years ago set up a matrix structure of activities or competitive sports subcommittees and resource and administrative committees. Thus we have committees on football, wrestling, fencing, gymnastics, skiing, and ice hockey. Resource committees are on biomechanics and medical aspects, headgear, padding, footwear, playing surfaces, apparel, and statistics. A new subcommittee on the female athlete under the chairmanship of Dr. Dorothy Harris of Penn State, was organized just this week in Philadelphia. The need for such a committee was pointed out in June, 1974, at a Symposium of Female Sports Injuries chaired by the President of ASCSA, Stan Pechar of New York University.

By now the great differences between NOCSAE and F-8 should be obvious to you. NOCSAE is much more influential in football because of the close contact with the NCAA and the NFSHSA, both of which make the use of any NOCSAE standard mandatory with the clout of the rules committees of those organizations. ASTM has more influence in skiing, fencing, wrestling, and ice hockey. So far both committees have put minor efforts into baseball.

The NOCSAE Committee is composed of organizations and the membership is closed. Technical conferences are open when held. NOCSAE standards cannot become national standards if submitted to the American National Standards Institute (ANSI). All of the ASTM's standards are submitted automatically to ANSI.

ASTM committees are open, anyone can join, and take part. Visitors may walk-in off the street to any ASTM subcommittee meeting. All ASTM standards are submitted to ANSI and the ASTM Ski Standards are becoming international standards. ASTM standards have credibility and are legally defensible.

ASTM's role is determined by its process, rather than subject matter. It's a matter of "how" rather than "what" and an essential part of the "how" is the guarantee that everyone may have his say. The preeminence of ASTM in standards-making activity stems in large part from the acceptance of the ASTM process and the recognition of the fact that ASTM standards are developed from a multi-bias point of view.

The NOCSAE Committee and the Football Subcommittee F-8.10 are in competition. Both have produced standards. ASTM believes the market place will choose the better and use it. Our management stystem for the development of safety standards, is available for you to join and use. We welcome your participation as General Interest and User members as well as any producers that are involved.

We enjoy good cooperation now with Dr. Hodgson. We are setting up a laboratory round robin to look at test methods. We do have a research proposal which hopefully will be funded by the Consumer Product Safety Commission sometime in 1977, or 1978, when we taxpayers give them enough money. We hope to look at some of the unanswered problems that Dr. Hodgson pointed out, the solutions to which only can be obtained by research.

Question and Answer Period

*Question #*1. We spent a lot of time and energy to improve our football program for next year. Despite all our efforts, we could not find anyone to tell us what was the best kind of helmet to buy. Is there any possibility that at some point in time these helmets will be ranked in order according to safety and/or will anybody who is in a responsible position come out and give us a definite answer as to what is the safest helmet to put on a youngster's head?

Hodgson: Well, the reason that's very difficult to do is because just looking at the helmets on the basis of laboratory tests is kind of misleading sometimes. For example, there's one helmet that I could recommend to you as performing best in the laboratory but then after its out in the field a while, it starts to develop places where the padding gets depressed and it doesn't perform as well, so I hesitate to go out on the limb like that. There was a manufacturer in the other day and he thought his helmet performed pretty well and I said let's put your liner in this other guy's shell and sure enough it performed better than either one of the helmets had to begin with.

I don't know if the actual numbers that they perform at would be at this stage a most valuable thing for you to have. You could inquire of the reconditioning people. They might be able to tell you what their experience is in terms of which helmets are holding up the best and this sort of thing. It's a little dangerous for us to go out and tell you which helmet to use. You might get a boy hurt in it and then we would feel that we went too far. Anyway, right now I don't think we want to endorse any particular helmet. I think gradually they are going to be getting better and better and it won't make that much difference. Right now I'll grant you that when they are tested in the laboratory there is a significant difference between the best and the worst but then again, some are better in some locations than others so it's kind of a "mixed bag" and it's hard to really define what is the best helmet right now. Some have shells that stand up better with holes drilled into them and they have better fatigue life than other helmets. Some stay safe for longer even though they're original safety is not up to what some of the others are.

Question #2. Just following that thought though, it would seem to me one of the major issues is to help people who need to purchase equipment. Isn't there some way that we can get a minimal standard?

Hodgson: There is. We have a minimum standard. That's what we are talking about here. This NOSCAE test is a minimum standard. Every helmet that has a NOSCAE seal of approval on it, is a certified helmet. It has passed the minimum standard which is, that they have passed under ambient conditions six tests, two drops each from 60 inches and have not exceeded the 1500 Severity Index limit, in addition to some other tests.

Question #3: Would it be possible in addition to having a minimum standard also to have a higher standard and to specify levels which could pass higher standards and minimum standards?

Hodgson: When you go to higher standards, right now we have about an inch to put in for comfort, fit and some energy absorber. If you go to a higher standard, you're going to cause the manufacturer, providing he's not making this helmet any bigger, to put a stiffer and stiffer liner in there. We don't know if that's going to be a detriment to cerebral vascular injuries and maybe help the boy have fewer concussions. We just don't know that much and we're kind of feeling our way along. We are really relying on the injury picture out in the field to tell us something, whether you like it or not. It's not pure science that we are dealing with here. If it was, we would be able to put our finger on it.

Question #4: Would you be safe in saying that possibly there might be a potential in developing a helmet that would absorb shock to a greater extent but yet might be more uncomfortable and give more low impact discomfort to the wearer? Would you make it more comfortable for the small repeated impact or could you make it less comfortable and still be able to absorb the massive shock. Are you trying to play a sort of in between on this?

Hodgson: That puts it in pretty good verbiage I'd say.

Question #5. You referred to some of the potential disadvantages of having too severe a standard. One of the reasons for that is that in order to pass the NOCSAE standard you must pass it not only at 72 degrees but also at 32 degrees and at 120 degrees. What are the actual chances of a player playing in a game where the shock attenuation material is at 32 degrees or 120 degrees Fahrenheit?

Hodgson: It's minus 20 degrees Fahrenheit, actually. You know a lot of the standards you write are based on past history and we put that in there just to make sure we weren't overlooking something. We have found that the helmets exposed to minus 20 degrees for at least 4 hours. actually performed better. The material crushes and in so doing it gives you an easier "ride down." Actually there's probably not much chance of it ever happening that a boy could even wear a helmet that was minus 20 against his skin, so that part of the standard may be changed. The hot part of the test by the time we get the helmets out of the oven, put on the head model and raised, the thermocouples indicate that the temperature is down at or just above body temperature, 100 degrees or so. I'm sure that there are a lot of places in the country where they are playing at that temperature. And that's about the most severe condition for a helmet, as you may know if you know something about materials.

Question #6: You can correct me if I'm wrong, Voigt, but I thought that the reason for the introduction of those temperature extremes was not what would happen when it was being worn on the player's head, but rather because these helmets were often stored for extended periods of time under conditions which would approximate those conditions.

Hodgson: Yes, it does have to do with storage and also with players picking up helmets on the sidelines. Probably it has more to do with the effects of storage.

Question #7. Are you going to look or are you looking at face masks in relation to the helmet or neck injuries? I guess my question is the protrusion factor, how far they come down, the leverage that's caused when they are hit, etc. Are you looking into those? Or are you going to look into that?

Hodgson: If and when we get a good neck model we would like to look at that because undoubtedly, manufacturers are in the dark about exactly where they should be with this face mask. It is probably a matter of fit and past experiences that have led them to where they are now. Maybe we could design better face masks if we did have a good neck model. Right now we don't. I would say in the future we are leading towards that but we are not at a point right now where we could say what's the best deformation characteristics of a face mask and how far out it should be and when it should break loose from the helmet or whether it should even be out there.

Question #8. I understand that there is some thorough legislation that is underway at this time to put the standards making process under formal control of the FTC. I wonder if Mr. Hulse would care to comment on that?

Hulse: This is Senate Bill S-3555. There are no more hearings scheduled. It contains three parts. One on international standards, one on the voluntary system in the United States and the certification of laboratories.

Now already the Department of Commerce has testified against the bill. Several other large government agencies including the FTC have studies and are going to testify against the bill. Both ANSI and ASTM were ready to testify against the bill when suddenly the hearings were called off. There are a few consumer advocates who think this is a good thing. We see nothing happening until the new administration, whoever it shall be comes into being after January of 1977. At some point in time we may call on you team members to write a few little letters to your Congressmen, if you believe in what we are doing and that the federal government should not step in and tell you, as members of ASTM, what to do.

Question #9. It sounds to me like the umbrella organization that was mentioned in Herrmann's presentation is or can be the ASTM. There are a number of problems facing us in the areas of athletic injuries and athletic safety. We need data on injury incidences before we can do anything that is anywhere at all associated with the establishment of standards. First, we must properly identify the product involved or the technique of the player or whatever. I would be remiss if I didn't admit, at this point, that I was not fully aware of ASTM's methods of operation and the organization, but yet don't know if I heard you correctly. Is what you're saying that the ASTM can serve in that capacity? My first question is: When will the ASTM convene the necessary people in order to attack the problem?

Hulse: I'm glad you first started off and said that ASTM is and then you said "can be." It's in the "can be." We can be the umbrella organization. We do have the power of convening. It depends on you and your organizations. If the organizations governing both women and men in sports wish, ASTM could call a convening conference to look at this multi-faceted problem.

Recognizing that until the NAIRS system is in place for maybe another year so that we would have some direction in which to go. If we do it prematurely, all we are going to have is a forum like we are having today, for a lot of people to get up and give their points of view and point out that we've got a big problem here, but that there are no solutions. So I think timing is pretty important. I would say that until the NCAA and the High School Federation, are of a single mind to help organize sports in colleges and high schools, and the other organizations too maybe the time is not quite right. Maybe this conference is going to be the springboard and it's too bad maybe, as it was mentioned last night, that we don't have 300 people here like the people that came out in Phoenix Arizona to hear about something that would give the edge to an athlete. We need something dramatic here. Former coaches and players and a rundown miler aren't going to attract anybody. So we need the help of the media. I don't think we have any media here that's going to write this meeting up. For the female athlete, we did have a reporter from the National Sporting Goods Magazine who is going to write it up and we hope to get more women out. We could help you form a little planning group. First, prior to a conference we need a lot of planning before we go ahead and "stick our neck out." We would assist any organization with these objectives and I hope you people from organizations would take us seriously and with Chairman Morehouse of F-8 and ASTM headquarters we're at your service.

Question #10. You mentioned something about services in your scope. Do you see in the services category, a committee on educational perspectives of the kind of things that we are doing right here at this Conference? I would say that as an educator, we need a brief outreach program for everybody that has attended this meeting, so we're able to go out and bring forth the issues and things that we are talking about here, so my point is, "where is the educational thrust?" Everybody says that it is important. Of course, I live with that every day and it is very difficult unless we have somebody looking at this. One good example would be in terms of our accident data system development. In the intricacies of that, and especially the area in which we are working, unless people know that you are going to fill out one of those report forms and a few other things in terms of the total system, we're not even going to be able to get good reliable objective data. I'd be interested in knowing how you interpret your services.

Hulse: I've got a real loose interpretation of services and as I pointed out, I'm stretching that definition. We're just getting into services and that key phrase "the promotion of related knowledge". Now Committee F-8 has that in their scope. And promotion of related knowledge falls in the educational field. We have sponsored in F-8 small, technical seminars and one national symposium. With the help of organizations such as gathered here, particularly with the educators, we could do more. We do have a professional public relations manager. He will send out press releases. We can call in reporters. By the way, we were also subject to our friend, Jules Bergmann's TV program in the flammability matter and we know what you've gone through and we know how to get around him and others. It may be one way to do it to get into your problem a little bit is like that lawyer from Chicago who was sued on a malpractice suit and he took umbrage against this because he felt he was 100% innocent. The plaintiff thought that the insurance company was going to pay off $20 or $30,000. The contingency fee the lawyer was going to get was about 30%. This happened right here in Cook County, Illinois. This lawyer went and looked up the standards for the Bar Association and he found that lawyers are not supposed to bring frivolous lawsuits. He got another lawyer and he brought up suit against this lawyer on the frivolous lawsuit basis and the judge and jury agreed with him. Consequently, malpractice suits in Cook County have dropped 40%. In other words, if you feel moved with your attorneys from the high school federation, go sue ABC. But that's getting a little bit off of your question. If I haven't answered it exactly in these discussion clarifications, I'd be glad to take it up with you tomorrow or anytime.

Round Table Discussion
Standards for Sports Equipment and Facilities

Moderator: Edward Mileff
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Indiana, Pa.

This round table discussion was largely confined to situations and circumstances surrounding the helmet standards of NOCSAE and ASTM which were discussed the previous day by Dr. Hodgson and Mr. Hulse.

The discussion began with the problem of lack of information on the characteristics of the performance on the human neck under the conditions of impact to the head as in football. It was noted that there is a problem with neck injuries because of the use of the head in football but in order to design better equipment, one must have some data on human tolerances with regard to neck injuries. It is just not practical to design and manufacture equipment, put it on the market and then evaluate it based on the number of injuries which occur.

It was brought out that the ASTM F-8 Committee on Sports Equipment and Facilities had proposed a research program dealing with head concussions and neck injuries. Because of the slow-down in the economy just about that time, there were problems in obtaining funds from private industry and so far there has been no support from federal agencies, although the CPSC is the only agency that has been formally approached in seeking support. It was a consensus of the group that research on the tolerance of human necks to impacts as well as additional research on head injuries is needed. It was suggested that perhaps NOCSAE and ASTM F-8 might consider a seminar on neck injuries at one of their future meetings, especially since there has been some research completed at General Motors and North American Aviation, a Division of Rockwell International, and at the National Bureau of Standards.

The question was asked whether the relationship between neck injuries and the face masks and/or use of collars has been under study. The High School Federation with its rule change for 1976 and the College Football Coaches Association with their statement concerning a change in coaching techniques seem to be moving in the right direction in order to eliminate the use of the head in blocking and tackling.

Most serious injuries occur in high school competition. This seems to be due to the lack of adequate summer conditioning programs, short pre-season practice periods prior to the first game, scrimmaging varsity players against freshmen and the utilization of out-dated and inferior equipment. It was felt that progress had been made but greater attention to many of these factors was needed.

A few individuals expressed the opinion that the NOCSAE Standard should be more stringent. It was reported that players were receiving concussions in certified helmets in football because some of the certified helmets were quite marginal.

There should also be more controls on the use of equipment. The proper fitting of helmets and their care are most important factors that must be considered even with the best of equipment.

Certain things have happened since 1969 when activity on the development of equipment standards first began: (1) the quality of helmets have been upgraded, (2) many more people are aware of the research that is available, (3) more research is going on and (4) rule changes have been made. Now, the statistics from NAIRS may provide some indication as to whether these factors are accomplishing a reduction in the incidence of injuries.

The point was raised concerning the use of padding on the outside of the helmet. There was no definite answer on the effectiveness of this but many felt the idea was worthy enough to warrant some research.

The problems of establishing a more rigid standard were also discussed. Such an approach would necessitate an increased stopping distance. The larger helmet shell would then create problems with increased moments of inertia, so it appears there must be a trade-off in order to be practical. Some ideas may be good theoretically but are not functionally or practically sound. For example, attaching the helmet to the shoulder pads might protect the player from neck injuries but one couldn't play football because he wouldn't be able to turn his head and see anything.

The problem of the face guard was discussed relative to the additional torque created when it is struck according to some people. One person noted that a comment from one of the speakers the previous day was that if he had to make a choice between the mouthguard and face guard, he'd rather have the face guard for protection. The question was raised as to the incidence of neck injuries prior to the use of face guards. Unfortunately, no one seemed to know if there were any valid statistics because this was before computers were used very extensively. The comment was also made that as the face guard was upgraded for more protection the coaching techniques began to change.

Over 25 years ago the face guards were attached with leather straps and only worn if a player already had a facial injury such as a broken nose. Then, the single plastic bar made of lucite began to be worn. These were too fragile and often broke leaving nice sharp edges. Then the double bar was utilized and the triple bar all made of plastic. In the meantime, steel bars were beginning to be used and now nearly every player wears the full cage. The cage permits the greater use of the head without fear of injury and even though "spearing" and "sticking" has been illegal according to the high school rules for some time, the rule was not enforced until this year. There was some agreement that the face guard is being unfairly blamed for the increased neck injuries and that it is valuable in protecting against dental and facial injuries.

The question was then asked if NOCSAE and ASTM were doing anything with hockey and baseball helmets. It was indicated that the ASTM committee is working in these areas and NOCSAE also is involved with head protection in these sports.

A brief discussion followed concerning the desirability of centralizing all standards writing in one organization. The point was raised that NOCSAE was not really a standards writing organization. They were formed because there was a need to upgrade equipment and the ASTM process was too slow. The ASTM, however, must follow prescribed rules and regulations so that its standards are defensible. It is often quite difficult to put specific numbers on a performance specification since data must be produced to defend this value in a standard, if it comes to a court case.

NOCSAE does have plans to revise its standard. Some aspects that are under consideration, are to increase the drop height for the test and already there are three different sizes in the head model. There is also some talk about reducing the criterion for certification from a Severity Index of 1500 to a SI of 1000. The replacement of the guide wire apparatus with a monorail system is also a possibility. It appeared that the establishment of a target limit was helpful so it could either be refuted or supported as additional information became available.

It was also suggested that perhaps it would be a good idea to formulate standards for recommended practices for fitting of equipment, conditioning of players and coaching techniques similar to the guidelines which are included in the new standard for trampolines.

The discussion returned to NOCSAE and how it is supported financially. Does the NCAA, NFSHSA and NATA contribute to NOCSAE or pay dues? No! all the financial support comes from the Sporting Goods Manufacturers Association which has contracted with Wayne State to do the research.

Football knee pads are another item of equipment for which ASTM is developing a standard. This may also be applicable to volleyball, wrestling, basketball and other sports except it would probably necessitate a different geometric shape.

Are there other kinds of standards that ASTM writes? Yes! — there are actually several types of standards, (1) a dimensional specification which simply spells out the physical dimensions of the material, product or system, (2) it could be a product specification which is generally used for buying and selling, (3) it may be a performance specification which is sometimes difficult to write if it allows freedom of design and material, (4) there is the standard method of test which the F-8 Committee has already written. This is simply a way of measuring something. These usually require interlaboratory round robins in order to determine the precision and accuracy of the test, and (5) there is the recommended practice. This is where we have only scratched the surface in the fields of sports and recreation. This can be a guideline or procedure on how to do something in a standard way that all parties have agreed to. What was suggested yesterday was that F-8 get more involved in the writing of these standards for recommended practice.

Since we have a couple of manufacturers here, regarding the question of maintenance and fitting of equipment, what would be the feeling of manufacturers if ASTM were to write a recommended practice on the fitting of football helmets? Would manufacturers agree to providing an instruction sheet which would be packed with every new helmet? There are different techniques for fitting helmets depending on the type of helmet. We manufacturers all tell users that the helmet has to fit snug, tight and fit all parts of the head, so much space has to be above the brow (illustrated with one finger above the eyebrow) and the ears have to line up with the ear holes. This is standard. Instructions in a box, however, doesn't insure that all persons will read them! The only way to be absolutely safe from law suits is to fit each kid personally (company representative) but this is impractical.

What relationship do the F-8 standards have to rule changes? None, but some standards might lead to rule changes. This is happening in some sports. The Penn State research project on wrestling mats may lead to a rule change since the head of the National Amateur Wrestling Federation is the chairman of the wrestling subcommittee. More input from players and coaches into the work of ASTM is needed. We need a football subcommittee chairman who is an athletic director, coach or administrator. We hope to have one at our next meeting. Don't you feel these people will be intimidated when asked to speak individually because it doesn't come through a national organization? A number of people are not prepared to speak or act. They are afraid to speak out of turn. Even if they represent a national organization they can not speak for the organization unless they go back and get approval first.

Does the legal department of ASTM have reservations about setting the helmet performance standard at 1500 SI? Not if all parties have come to an agreement that this should be the standard. There will be no criticisms from the legal standpoint because you have achieved a consensus standard. There are lots of numbers in many ASTM standards. There is no overview committee, nor can there be because you are the technical experts. No ASTM standard has ever been brought into court as being technically unsound. If the present NOCSAE standard were taken and put through the ASTM process and it survived unchanged, it would be legally defensible. But if there were some negative votes and it got changed, then it is altered accordingly. This is what is in progress now. If "Procedure B" is adopted with a 1500 SI in it, the NOCSAE and ASTM could make a joint statement that they are in agreement. That is what our goal is presently.

It was agreed that the word on the progress, accomplishments, and problems in the writing of standards should be publicized. Hopefully, the proceedings of this Conference, which will include the formal papers and the group discussions, will help to do just that.

Litigation in Competitive Sports

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Recently an athletic director, thoroughly frustrated by the complexities of law and sports, urged all college presidents to fire their athletic directors and replace them with attorneys. His disgust at the increasing number of million dollar sport-related law suits and the confusion that seems to exist appears to bear out the statement that there are two things in this world that no one should see being made: *laws and sausage!*

No one connected with competitive sports appears to have immunity from litigation. A 16-year-old boy was severely and permanently injured during a high school basketball game (1). He and his parents sued for $950,000 from the following organizations and people:

(1) the state high school athletic association
(2) the two school districts of the participating schools
(3) the officials' association
(4) the boy's coach and his wife
(5) the opposing coach and his wife
(6) both referees
(7) the player who allegedly caused the injury

For years the courts consistently held that participants of sports assumed the risk of the game. It is obvious today, however, that as many groups and people as possible will be sued in the hope that someone may be found guilty of negligence and made to pay the price. The original concept has validity today, but several trends pose a threat to many people associated with competitive sports.

Rights and Due Process

More cases are lost because procedural due process was not observed than on the merits of the case. Many people feel that due process is permissiveness and coaches particularly question the value of due process in athletics. Speaking in *Nutshell Magazine*, Justice Black found support when he complained that the Supreme Court's granting of rights to individuals encouraged a new era of permissiveness. A federal judge took exception to Black's statement and warned that "the risk taken by a few who abuse their (rights) is outweighed by the far greater risk run by suppressing constitutional freedoms."(2)

For example, two Minnesota University basketball players were penalized by their athletic committee for their part in a wild brawl against rival Ohio State (3). The athletes were prohibited from participation in any future varsity basketball games.

The faculty representatives of the Conference felt that the punishment was inadequate and without a hearing added the prohibition of any practice that year. Both athletes sued the Conference Faculty Representatives, claiming that their rights of due process as guaranteed by the Fourteenth Amendment had been violated.

A federal judge supported their argument and ruled in their favor. Due process must be observed.

In a related case, a New York court upheld the action of a coach who withheld the varsity football and track letters earned by an athlete. The boy reportedly violated training rules after both seasons were over (4). The judge ordered the case back for reconsideration however, because the coach failed to give the boy a chance to respond to the charges against him. Again, due process had been violated.

I went through 20 days of the worst situation I've ever been in with one of our athletes who was accused by another school of having registered there, which would have made our team totally ineligible. We would have received the worst publicity and this boy, who was a freshman, could never have played again. We asked to be investigated, and found out some things that you don't believe happen in sports. I became convinced, that while a lot of people think there's a lot of permissiveness in society today, you better at least call the person in if you are going to suspend your athletes. Tell them the reason that you're going to do this. Let them respond as to why or what and then you have an impartial hearing. People think you have to go to court. You can simply let the coach listen or have the athletic director or the principal present to hear the facts.

This is an important area for all those connected with competitive sports. Procedural due process is simply fair play and involves the following basic steps:

(1) an individual must have proper notice that he is about to be deprived of life, liberty or property;

(2) an individual must be afforded the opportunity to be heard; and

(3) an individual must be afforded a fair trial or hearing (5).

Injury Caused by a Participant

It has been generally accepted that participants injured in an athletic contest cannot recover damages for an injury caused by another participant. A recent case, however, may dramatically change litigation in competitive sports. Julian Nabozny, a soccer goalie for Hansa High School in Winnetka, Illinois was in position to receive a pass from a teammate in the penalty area (6). An opponent kept running toward him and kicked him in the head causing serious injuries. Nabozny sued the player, alleging that he did not attempt to avoid contact in the area of the penalty zone which prohibits contact by the rules of soccer, but did in fact deliberately kick him. Barnhill, the defendant, argued that the plaintiff was guilty of contributory negligence since he participated in an athletic contest and assumed the risk of the game. He claimed that he owed no legal duty to Nabozny.

Nabozny lost the decision in the trial court but appealed the decision to the Illinois Appellate Court. Several key points were made in the higher court that can affect future injury cases. While the court realized that the law should not put unreasonable "burden on the free and vigorous participation in sports by our youths," it did insist that "some of the restraints of civilization must accompany every athlete onto the playing field."

The court discussed the role of athletics and the educational benefits the participants receive, such as the opportunity to learn self-control. The main argument centered on the violation of adopted rules rather than the development of skill, in order to protect the participants of the game. It stated that:

> "when the athletes are engaged in an athletic competition; all teams involved are trained and coached by knowledgeable personnel; a recognized set of rules governs the conduct of the competition and a safety rule is contained therein which is primarily designed to protect players from serious injury, a player is then charged with a legal duty to every other player on the field to refrain from conduct prescribed by a safety rule.(6)"

The court recognized that this statement was a breakthrough in an area that was previously "uncharted in the law of torts." It devised this rule "to control a new field of personal injury litigation."

Although an athlete does assume the risk inherent in a particular activity, the participant does not assume the risk that results from the negligence of another participant. And the court clearly has indicated that an athlete does not assume any risks that are of an extraordinary level unless he was aware of them and voluntarily accepted them. It appears that in the future, deliberate violation of rules with the intent to inflict injury will be subject to liability. It is still a cloudy area but one that will bear study and consideration.

Litigation Against Officials

For years officials have been relatively free from law suits but recent cases reveal a trend that might change this virtual immunity.

In *Hinton v. Pateros School District* (1) an injured boy and his parents sued both referees, contending that they knew the basketball game was too rough and that they ignored the protest of the coach against the rough play. The plaintiff charged the officials with negligence and failure to use discretion in allowing the game to develop into "an abusive, physical contest." In this case, the plaintiff also sued the officials' association for using officials who did not enforce the rules of the game. The association was charged with the duty of supervising and preparing officials in a proper manner according to the plaintiff. The case is still pending.

Percy Penn, a football and basketball official for the Southwest Conference for the past 25 years, instituted a law suit for $1,000,000 against the Tulsa Tribune Company for alleged defamation of character (7). Penn charged the newspaper with false and libelous statements which, he claimed, "would in the mind of the ordinary reader, impute to plaintiff, a complete lack of honesty, integrity and virtue and accuses him of not being an impartial referee and with intentionally and habitually making wrong calls as an official in order to obtain favorable results for certain participants." This, too is pending.

A final case illustrates the variety of cases in which officials are involved. In *Watkins v. Louisiana High School Athletic Association* (8), a spectator was involved in an argument with a basketball referee. The High School Athletic Association prohibited her from attending any athletic event in which the high school was playing. She sued the Association claiming that it had violated her right of privacy guaranteed by the First, Third, Fourth, Fifth and Ninth Amendments of the Constitution of the United States. She also alleged that her right of due process was violated since no one notified her that a spectator could not engage a referee in conversation or touch them.

The appellate court upheld the decision of the lower court in allowing a private association to set rules which were fair and honest, including barring this particular woman from the games for one year.

It is clear that in today's competitive sports scene, litigation involving officials will be an important area.

The Liability of the Team Physician

In a day when law suits are commonplace and athletes are suing for every possible reason, team physicians until now have enjoyed a rare immunity. However, altruistic attitudes toward the team physician may become a thing of the past if recent cases are indicative of the day in which we live. Michael Gallagher, an Ohio attorney, predicted in 1972 that litigants will become dissatisifed with the amounts of insurance school districts carry and seek other sources of revenue (9). It is possible, he predicted, that doctors and hospitals will become the target of such lawsuits and once the individual is successful in recovering damages "the flood gates will open."

His prophecy came true the same year when a thirteen-year-old boy was awarded $4,025,000 by a San Francisco court (10). The boy was injured in a playground fight when another boy struck him with a baseball bat. A doctor and a medical crew at the hospital examined and released him but several hours later readmitted him for extensive brain surgery. While he received only $25,000 from the school district for its failure to supervise the playground, he successfully sued the doctor and hospital for a record four million dollars.

Since there is no case law governing the conduct of a team physician, it has been said that a physician is bound by the general principles of law relating to a physician's responsibilities. While the athlete may assume the risk of a particular sport, he is not responsible for negligent treatment by a physician. It appears that the athlete will not be responsible:

> if he were examined by a doctor, and the doctor through negligence erroneously found no medical conditions making it inadvisable for him to participate in the sport. (9)

Two weeks ago at one university a boy was swimming in the pool taking laps on a swimming team. He had already set a record in high school that was better than the current record at the university. He's gone. When they pulled him out of the water, they found he had a heart attack and died. The school already had a case where a boy drowned in the swimming pool and they had a $23 million suit against them, so I know these university officials must have gone through mental agony until they learned something from the mother and father when they called them. You see the school did not give the boy any physical. The mother and father said, "Yes! We knew it would happen anytime because he had that condition. But we wanted him to live a normal, active life and we knew it could happen while he was in a chair, while he was in his class or any other place." The father, who was in physical education at another college, understood. What I am saying is, what would have happened had the boy been swimming, died, no physical and the parents didn't know that the boy had that kind of condition?

The athlete with the disqualifying physical condition is going to be another area that you are going to see in litigation.

I was asked to speak at another school last year. When I got there, somebody warned me or I would have been caught completely unaware that they had gone through a tremendous period of campus unrest because of a young man who went out for basketball. At this university they have a rule that a "walk-on" or anybody out for trials (they have 400 students a year who try out for different teams) does not get a physical till he makes the team. So this young man tried out, made the basketball team. The next day he was dismissed because he had one eye. They had a tremendous stir in the community. The American Civil Liberties Union got in on it and they got a temporary court order to let him play. An athlete who has one eye who played professional basketball was on a campaign so he came through and shot baskets with him, the day that I left, to publicize it.

I asked a question of Dr. Ryan yesterday. Dr. Ryan gave a sensible answer to what is being done in Wisconsin. But I would ask now, what happens to the boy who is not of majority age? I think if you are of majority age and you sit down with your parents and sit down with the doctor and you agree. If you know the situation, I can understand it. But what if the boy is 14? What are the legal ramifications if he goes out for the team and there's negligence and he loses the other eye or he has one kidney and he injures the other kidney and dies?

I think you are going to find that this is going to be an area which is going to be litigated heavily.

Many high schools and colleges are unable to have the services of physicians at games played away from home. This puts the school and coach in a precarious situation if a serious injury occurs. In most instances, the host team willingly shares the services of their team physician. This brings up an interesting point; what is the liability of a doctor in such a situation?

Once again, Gallagher cautions the team physician to consider the fact that he becomes vulnerable to legal action for negligence. If a physician treats a participant in the absence of consent, either expressed or informed, he might face assault and battery charges.(9) The perils inherent in such action are illustrated by the following:

"The doctrine of informed consent is one upon which many suits are currently based. Its real value to a plaintiff's attorney is that it obviates the need to establish negligence on the part of the doctor; more particularly, it avoids the necessity of producing competent medical testimony that the offending doctor; has deviated from the appropriate standard of care." (9:70)

The doctrine is applicable to competitive sports, thus it is essential that the physician secure permission in writing for the authorization of care and treatment for injuries sustained in a game or during practice. Any treatment beyond emergency care should be sanctioned by parental consent or the informed consent of the patient who is aware of the risks associated with the treatment.(9)

The following contents on the form used for physical examination for competitive sports should be helpful:

NAME: ____

Last First Middle Initial

Parental or Guardian Permission:

As a parent or legal guardian I authorize Dr. __________________ acting as team physician to examine the above named student and in the event of injury to administer emergency care and to arrange for any consultation by a specialist, including surgeons he deems necessary to insure proper care of any injury. Every effort will be made to contact parents or guardians to explain the nature of the problem prior to any involved treatment.

In the absence of the team or authorized physician, I grant permission to a qualified physician to furnish emergency care using the guidelines above.(11)

There are three types of people connected with athletics today. First, the ones who are indifferent and apathetic regarding the welfare and safety of individuals under their care. This group fails to properly supervise, inspect facilities and equipment and in general, observe rules of safety.

The second group is so frightened about the possibility of legal entanglements that they go to the extreme and become overly cautious. In too many instances, worthwhile activities are eliminated or curtailed because someone was injured or the specter of injury looms dangerous.

The third group is too often in the minority. This group realizes that there is some risk in all activities and this is natural and in many instances, desirable. This group attempts to follow the rules of safety and sets as priority the welfare of the individual. It is imperative that more people become aware of the factors that involve liability. Not only will our athletes be protected and injuries prevented, but court cases will diminish and coaches will spend less time in the courts.

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Liability In Informal Sports and Recreational Programs

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Dr. Appenzeller talked to me before the session about the relatively short attention span of some people who should be vitally concerned about this liability crisis. It reminded me that just a few months ago I spoke to an American Society of Mechanical Engineers Meeting and afterwards the president of a small company came up and started to discuss some of his severe problems. I mentioned some quick affirmative measures he could take to reduce or minimize his liability exposure. He got very excited and said, "I pay my insurance and it's up to the insurance company and it's up to the high-priced lawyers to take care of this and to protect me. I do not want to be bothered. If they want to remove the bread from the table of 200 families of my workers, let them do it." It reminded me that about seven or eight years ago, a similar thing occurred. Just a few months ago that particular company went bankrupt from product liability claims.

Today, the cost of liability insurance and related product safety measures, account for as much as one-third of the retail price of some products. As far as municipalities are concerned, because of what is happening in the recreation and sports area, some municipalities with seemingly good records have been cancelled by their insurers as many as three or four times in the past year. Many municipalities, as you may know, are now going naked or self-insured, (which is virtually the same thing). It is very difficult to get realistic useful data from insurance companies as to how to minimize or reduce the liability. One company, a major corporation, not too long ago after failure to obtain information useful to an effective loss control program, cancelled the insurance, went self-insured with a captive. They now have information they can use and have affected a 30% reduction in loss.

Other people feel that somehow or other they can get a special legislation at the federal or state level. They believe there has to be legal reform and also, there has to be insurance reform. What they want is some magic standard. They hope relief will come somehow so they don't have to change the way they are doing business. That is just an invitation to disaster.

I am going to present some prepared remarks I wrote before I came here and I believe it to be an unbiased view, as I really have no self-interest and I am not representing anyone and I am not attempting to get any business or anything of that sort. My main reason for being here is that I see too many people who are just "sitting ducks." Even if I should happen to be on the opposite side, plaintiff or defense, I would like to at least see some competition.

In competitive sports, individuals do battle, under specified rules of the game, and, after the conflict has finished, a victor may have emerged. Lawsuits are also a means of resolving conflicts, under specified rules of the court, but no victor really emerges. There is restitution for damages already suffered by the injured side, but restitution only if fault can be proven against the other participants in the lawsuit. Fault, however, may be judged according to rules of the game that seem to be gradually changing to favor the injured party because of: (a) our changing concepts of social fairness or equity, (b) changing beliefs as to who should and could best bear the economic burdens in a free enterprise and democratic system, and (c) changing concepts as to what may be in the public interest where avoidable and repeated accidents are clearly identified. If someone says there are 750,000 injuries each year from basketball playing, it furnishes the motive for attempted regulatory action, closer supervision and changes in game rules, equipment and facility improvements, and a social purpose for lawyers representing those who claim to have been needlessly injured. Thus, liability in informal sports and recreation programs should not be just another remote incidental concern or a topic of complaint and argument by those whose complacency may seem threatened. Liability is a present threat, but only to those who fail to recognize their new legal obligations and fail to take reasonable steps to safeguard the health and safety of those who rely upon them.

Some of the major safety program deficiencies in sports safety, that exist today, relate to safety audits, predictive analyses, and concepts of unsafe acts. These deficiencies set the stage for liability problems.

As to safety audits, it should be understood that safety is not just a simplistic mental attitude based upon purely common sense and elemental principles. It is a technical discipline of fairly wide scope, complexity, and subject matter depth. It is a specialty which has amassed considerable knowledge, is a licensed profession in some states, and there are peer certification or board specialization procedures which serve to help identify those *minimally* qualified in the applicable safety specialty. Yet, we find well meaning individuals given safety responsibilities who are almost totally unaware of the safety techniques, principles, facts, and methods commonly used by safety professionals or even the identity of safety organizations where such knowledge may be obtained. Knowing what one does *not* know, is particularly important where others entrust their very lives and limbs to the proper discharge of assigned safety responsibilities. Thus, if someone is assigned a safety program responsibility and does not possess a license or certification in safety, some good faith attempt should be made to get appropriate technical backup or expert consultation services from a safety specialist. For example, a safety audit can be scheduled periodically, to be performed by an outside independent safety professional, to evaluate a facility or equipment, procedure or process, or program. This is essentially a *post facto* audit by a specialist. It might cost say $500 or more. Generally, it is advisable to rotate the specialist so that a different perspective and experience is applied at each audit. Don't rely upon the self-proclaimed expert. The competency of such specialists may be determined by contacting the appropriate professional societies, cross checking with others in the expert's specialty, and from his professional reputation among others in the application under consideration. These safety audits are called *post facto* because they evaluate situations and circumstances as they actually exist at the time of the audit.

Another approach to minimizing possible liability is to perform predictive analyses, such as those used by system safety engineers. These might be performed in the planning stage of a sports facility to evaluate equipment proposed to be purchased, or to assess procedural performance before undertaking a course of action. What the safety analyst calls predictive, the lawyer calls foreseeable. Thus, there are techniques, in common use today, that permit a systematic and comprehensive safety analysis to be performed, that will predict errors and injuries, allow cost-benefit evaluations of proposed alternatives or remedies, and will serve as some evidence of due care in lawsuits questioning the proper discharge of safety responsibilities.

Still another approach to minimizing liability is to reduce any undue emphasis on unsafe acts. The "knee-jerk" response of blaming the victim for unsafe acts is as unproductive as believing that all accidents are unavoidable Acts of God. Blaming the victim is easy, but it often sets the stage for repeated injuries given the same circumstances. Obviously, every accident should be investigated to determine all probable causes and feasible remedies. But an accident investigator who consistently blames only the victim demonstrates the warning signs of professional incompetency, myoptic prejudice, or a self-serving role as an apologist and loyal defender of the faith even where the going gets rough. We live in a world of multiple causation, not absolute fault. The law, reflecting the realities of a technologically complex world, is changing its perception of causation and liability relative to the victim. For example, in strict liability lawsuits alleging that an item of sports equipment contained a defect that caused injury, "foreseeable human misuse" is no longer a defense in some states and the "obviousness of the hazard" is no longer a defense in many states. That is, since certain forms of misuse and abuse and improper maintenance are foreseeable, it is the manufacturer's obligation to design a product that will not cause unreasonable harm given reasonably expected misuse, abuse, and improper maintenance. Similarly, the change from contributory negligence to comparative negligence, means that the victim who was formerly denied any and all relief because he was, in any small degree, at fault, now can recover to the degree that others were also at fault. That is, the old law harshly denied relief if any blame could be placed on the victim, but the new law says that each should pay according to an apportionment of fault or blame. Thus, multiple causation and human fallibility have been humanely recognized. Therefore a safety specialist who persists in blaming only the victim for his unsafe acts is a legal anachronism who is blindly leading others into liability claims that could bring about personal and financial disaster when least expected.

In general, evasion of moral responsibility for high standards of safety is less excusable with the eroding legal defenses of contributory negligence, freak accident, unforeseen event, unavoidable accident, special statutory immunities, and arbitrary distinctions between licensees, invitees, guests, known trepassers, and undiscovered trespassers as effecting duty and liability. The technical intracacies of the law are becoming less available as society demands a correction of a social illness in the form of a careless disregard of safety when balanced against economic or other interests. Ordinary care and skill to avoid injuring persons, on or near the event, must be the principal basis of managing and implementing any sports and recreation event, rather than reliance upon possible defenses and past lawsuit victories. The question will be whether the organizers, promotors, and supervisors acted as reasonable persons in view of the probability and severity of injury to others.

Liability is often based upon allegedly defective unsafe products, inadequate supervision, insufficient protective devices, improper facility layout, bad maintenance, improper selection of activity, failure to warn, improper emergency treatment, and many other claims that seem to fit a situation where there has been either unsafe conditions (that is, strict liability) or a failure to exercise reasonable care for the safety of others (that is, negligence).

What may have been the customary standard of care in the past, could be considered negligence today, because the public seems to be demanding a higher standard of care relative to safety and a reduction in an intolerable frequency and severity of injury toll that shocks the conscience of many citizens. The acceptable and permissible level of risk is being reduced, what has been considered a reasonable danger may have become unreasonable because of alternatives that are now economically and technically feasible, and there are hazards that can be identified today that were unknown just a few years ago. The heightened interest in safety has become evident and manifest in the consumer safety movement, the medical malpractice crisis, and the proliferation of governmental regulatory agency mandates such as those given the OSHA, NHTSA, CPSC, FTC, EPA, and the NTSB. Safety always has been akin to motherhood, but practical analogies to planned parenthood and the pill are specifics only recently applied to prevent or minimize the consequences of undesired events that give birth to a staggering toll of injury and property damage.

There are other factors that threaten the sports safety profile, for example, social transition and hazard identification. On one hand, social transition seems to make it more difficult than ever to control participants and spectators of recreational events. On the other hand, the courts are urging better enforcement of rules and regulations, are broadening liability for failure to perform assigned or implied duties, and talk of "negligent supervision" for not discovering dangerous activities, not preventing rowdiness and fighting, and not controlling disorders that could threaten the safety of participants and onlookers in recreational and sports activities. In essence, the courts are redefining the standard of care by escalating the criterion of what is reasonable and prudent to that of the average of that expected from a professionally trained person in the occupation.

Similarly, the increasing availability of technical information on hazards, and persons skilled in recognition of hazards, has heightened the potential liability of those involved in recreational and sports activity. In essence, it is simpler to prove to a jury that a particular hazard was well known as a cause of injuries, that it was of significant risk, that safety specialists considered it an unacceptable danger, that it would cost only so many dollars to correct, and that an accident would not have occurred or the injury would have been less severe, if appropriate action had been taken. In addition, that there were safety specialists qualified, competent, available, and willing to perform the necessary work at reasonable cost. Also, the the agency, entity, or individual responsible did not seek the help of a specialist, did not engage in relevant professional self-development, and was not licensed or certified in the appropriate or relevant discipline.

It is not unusual to find that there is no designated safety specialist covering a specific sports event, recreational activity, or leisure time game where the general public might assume or expect that reasonable steps had been taken for the protection of participating adults or children. It is not unusual to find that the safety program is so general in nature as to be ambiguous and meaningless. It is not unusual to find that no individual or group can be identified that has the responsibility of initiating a requirement for warning signs, for determining the composition and type of warning to be displayed, or for assessing the adequacy of warnings already in existence.

One serious deficiency in understanding the legal requirements for safety is displayed by those who claim or believe that compliance with safety standards is all that is necessary. Very few lawsuits are ever based on a violation of a code or standard, yet thousands upon thousands of defendants are found liable each year in standards-related cases. In essence, compliance with safety standards is only a very preliminary and marginally effective means of assuring the public safety. Such safety standards, federal rules or bans, safety certifications, and voluntary recalls cover only the most gross generic and offensive departures from due care and are usually not effective at moments of greatest public exposure and risk. While safety standards, regulatory actions, test certifications, recalls and bans, and similar efforts play an important and essential role in the *overall* safety movement, only a fool would believe that they play a substantial part of any *particular* sports or recreational safety program today. The courts have repeatedly held that compliance with federal safety standards does not preclude common law liability for defective products. Therefore, you may have a safety technician who talks in terms of compliance, but not a professional safety specialist. Your standard of care should be that of a "professional," not a ministerial safety "technician."

There may be liability if you are either directly or indirectly involved in an informal sports program; if you encourage, sponsor, assist, organize, fund, advertise, endorse, retain some control, or provide equipment, facilities, or personnel for such an activity. The nature and extent of your legal obligations vary from state to state, the attitudes of jurors vary from locality to locality, and the facts of each case are always differnt. Thus, clear statements as to what the specific law is . . . can only mislead. Instead, what is desirable is a general understanding of the relevant legal obligations and trends in the law. Enough understanding to create an awareness of when and where to seek legal counsel from the attorney who is the lawyer dealing with your recreational and sports program. Remember, he cannot answer your questions unless you are sufficiently *aware* to ask him the right question.

The expectations of the general public and the juries parallel their economic investment in school systems, recreational facilities, sports programs, and leisure time athletic events. Go back 50 years and think about the education and training and salary of our public school teachers and compare it with the educational achievement and salary of teachers, coaches, and administrators today. Think about the dramatic increase in the investment of taxpayer dollars during the past 50 years, in school systems, recreational facilities, and sports programs of both an organized and informal nature. Think of the change in salary levels and number of people involved in recreational and sports activities. Think of the decreasing provincialism and increased knowledge as to what is acceptable and desirable. The general public pays more and expects more. The taxpayer, sitting as a juror, more and more understands that large dollar verdicts in catastrophic injury cases are actually paid by insurance carriers that spread the risk, that large verdicts are diluted by a broader base of taxpayers, that large verdicts are no different than the indirect social welfare costs that would otherwise result from such injuries, and that large verdicts serve a therapeutic function on otherwise reluctant agencies or entities. This rationale is also evident in the gradual demise of tort immunity formerly granted governmental agencies and charitable institutions. The inescapable conclusions is that there is a threatening storm on the horizons of sports safety and that reasonably prudent individuals will realistically reappraise the situation and take all necessary precautionary measures to avoid becoming a victim of a sudden cloudburst over their sports activity.

To avoid or minimize liability or the discomfort of lawsuits, you could get to know your local lawyer so that you better understand your legal obligations and learn something about your possible role in future lawsuits. However, you should also get to know your local safety specialists so that you can effectively translate the legal obligations into a meaningful reduction of risk for those who might be injured in the future. This should be of some concern, if your safety efforts are not commensurate with the duties now being imposed under our system of laws.

Just a couple of additional comments. Dr. Appenzeller mentioned some unusual lawsuits. This morning I ate breakfast with someone who serves on the board of an insurance company. He was telling me that in order to spread their risk, they are making sure that a wide range of additional defendants are being included. He described several cases in relationship to possible defendants. The defendants were rather remote but they are setting up a more creative approach to thinking about possible liability of people. But I think the liability is fairly remote.

I think there were also some questions earlier on warnings. I heard someone at one table talk about warnings and brochures. Warnings and brochures are sometimes package inserts. Really, what good does that do? It may reach the initial purchaser to be filed away in a desk. Your obligation is to communicate with the person who is going to use that equipment, so you must make sure that the warnings are of a permanent form and effectively and adequately communicate: (a) there is a danger or warning or special instruction, (b) the reason why, (c) what the person should do, (d) what might result, and (e) what to do about it, if the unfortunate event occurs. But many manufacturers don't supply warnings. Warnings are extremely difficult to formulate, translate, and develop into pictoral form. I have been in design situations where we spent months and gradually it boils down into something that we thought was virtually impossible. Of course any warning is like a two-edged sword. You are warning someone, so they can appreciate the nature of the specific risk, and take appropriate action. But you are also saying, if you're a manufacturer, that you acknowledge that you were aware that there was a significant safety hazard in the product, before you marketed it.

In many companies, during design reviews wherever there is a caution, warning, or special instruction, that is a signal to go to the project engineer or specific designer and say "Hey, we don't want the product to go out with that warning on it. Let's stop and think how we can redesign the product now, so that such a warning is not necessary."

There were also some comments earlier at one of the tables whether somebody 16 or 17 years old could sign what, in effect, is an informed consent. There were some comments about how bad the law is. Regardless of what the law is, in our form of government, we have jurors lay jurors, average citizens sitting there. It's what they believe not really what the lawyers say. Lawyers argue, the witnesses testify. Even when the judge tells them what the law is in the form of the jury instructions, they use a heck of a lot of common sense. The law is way in advance what most jurors are willing to accept. Although it is still very easy to defend a case, it's getting more difficult every day. There is still time for people to see where the law is going and to take affirmative steps to improve the products, to improve the nature of the services in the sports area and to escape the fate that is going to be fall, unfortunately, far too many people.

Question and Answer Period

Question #1. You mentioned strict liability as related to general negligence and then you talked about comparative negligence in relation to contributory negligence. How does that fit in, especially the latter one, with the conversation you had, I assume when you were talking about multiple defense, litigation, etc? Do I make myself clear?

Peters: In contributory negligence if the jury found any fault about what the plaintiff did, the defendants would win, even though the defendants may have been 99% at fault. This had the effect on reducing the number of potential law suits in cases. Comparative negligence means that if a plaintiff, the injured party was 20% at fault, he could still recover 80% of his injuries.

There are many forms of comparative negligence, but the trend is toward pure comparative negligence. I have here a summary of jury verdicts in Los Angeles for September 17, 1976. Here is a basketball injury case. The injured party, the plaintiff, was a 19-year-old student, who was playing one on one in a corner court. He catapulted into a brick wall, four feet from out of bounds, after stepping on a loose basketball pursued by both players. They claim that the defendant, Occidental College, was negligent for not having more padding, as on the main court. The injuries were a comminuted fracture of the left forearm with a residual 10% loss of extension. The medical bills of $3,700 and lost earnings of $2,100 were also claimed. Now, the defense claimed there was no negligence, it was a freak accident, it was not reasonably foreseen, and the plaintiff, the injured party, was contributorally negligent. Before trial, the defendants offered $10,000, the injured party demanded $25,000. The trial lasted three days. The jury found that the plaintiff was 25% at fault, or 25% contributorally negligent. Under the new law in California, this means that Occidental College, the defendant had to pay 75% of the injury costs. The jury poll was 12 to nothing. They only needed nine but got a unanimous verdict against Occidental College. They awarded 75% of what they thought the injuries were or $15,637. A year ago, if they had found the plaintiff 25% negligent, there would have been zero dollars awarded.

Strict liability has the effect of reducing the amount of proof the injured party has to present. All they have to do is prove that the product was defective and that defect caused the injuries. Many courts refuse the admission of any evidence showing that the defendent exercised care commensurate with the custom of the industry. In other words, the standard of due care is no longer relevant in many courts in strict liability. It's just was the product defective? Was it properly designed, manufactured, or was there the failure to warn or instruct? Was it defective and did that defect cause the injury claimed ? If so, there is only one defense, assumption of the risk, and that's being narrowed down so the injured party must appreciate the specific hazard and the magnitude of the risk. Some defense counselors say that assumption of risk is being narrowed down to the point where there is no longer any defense in a strict liability case, other than attacking causation.

Question #2. There is another question I asked concerning the conversation with the insurance people. If an insurance company has me as the policy holder, I interpreted from your comments about this morning's conversation was that its a good healthy thing for the insurance industry, which has me as a policy holder to try to get somebody else involved in that case, if you will, to allocate some of the costs to other sources. Was that the essence of the statement?

Peters: For example, in comparative negligence, where the jury is allocating a percentage of fault, if you have additional defendants and, if the insurance company can cross claim or somehow get additional defendants, then, instead of that one insurance company being 80% liable, it might be a 40%, 20%, 15%, or 5%. Spread out their losses in catastrophic injury cases.

Question #3. Do you imply that there is an effort on the part of the insurance industry to push for this?

Peters: The casualty insurance industry has, consistently for the last couple of years, been losing great sums of money in liability despite the fact that they increase their premiums three, four, five, or ten times, have more exclusions, large deductibles, or attempt to reinsure or make the insured eventually pay the various levels making the insured bear 25-30% of the overall cost. Regardless of what they are doing, and there are many different approaches, they are still losing money. They will continue losing money until their insured take new steps to reduce the losses. You are going to find more and more emphasis on preferred risks. If people don't set up a positive affirmative program which is practically oriented, they're not going to have reasonable insurance premiums.

Question #4. Would you please discuss briefly the liability potential of an employer, say a school board, principal, superintendent or what have you, arising from an athletic injury when there are no required qualifications for an interscholastic athletic coach other than being a certified teacher in that particular state. In other words, if I as an administrator, hired a coach who had no background in sports safety or even in the technical aspects of coaching, and an injury arises out of his lack of knowledge, would I be liable?

Appenzeller: I think again you are going to go back to the individual state for the most part. There are situations and I could give you cases and maybe one of the best is in Tennessee where the wrestling coach resigned. The school employed a man already on their staff who said, "I'd like to coach. I've got a little knowledge of wrestling." He introduced into the class, a new hold he called the "Agora" hold. I never found anybody who knew what it was and then found out it was a modification of a certain hold he saw in Hungary when he was in the service. He had no qualifications to teach it.

There was no escape, no release once you got into that hold. And he had two sets of people wrestling and he was watching one and this other man over here got in the "Agora" hold and broke the boy's neck, severed his spine. Well! they found the school guilty because they used an incompetent man.

Now you go back to New York. A Spanish teacher supervising a playground letting them play bombardment with softballs, you know, the hard kind. And letting the boys play against the girls. She told the school board "I know nothing about physical education. I am a Spanish teacher." They said "That's ok, you can supervise the playground." She didn't observe any of the rules of the game, used the wrong equipment, then after that moved away from the area. A girl got hit, she came off, she said "Don't hit me anymore, I've been hit." A boy took a ball and hit her in the eye and she lost her eye. The school board was the one found guilty because they had employed an incompetent person.

Now! I was really distressed when I was in Milwaukee this summer to hear people from Wisconsin, Illinois, Michigan, tell me that more and more teachers are being told that you coach football and you coach wrestling and you coach something else, who have had no background. They say you either do it or you don't work. So the teachers are taken out of their realm of capabilities. I think the school board is liable and it has been proven so many times in New York, for example. New York has paid, when they had somebody who was incompetent and I don't know whether your state has a different type of law that will protect you or not. For example, the case you mentioned would never have held up in New York. There was a boy 19 years old ran right into the wall, right under the basketball goal. He had come in, he had gone to that school, but had graduated. The court simply said, You knew there was a wall there. And no other city school with a wall, has a protection under there. It's just general practice and you knew it. They just threw it out. Now, if New York had that law, there would be comparative negligence.

But California, I think, has been a little ahead of everybody in their law. They wrote me this summer when I was going to do a paper in Milwaukee on this new contracting which is independent activities. California has already cancelled insurance policies. Insurance companies say if you use that program, we're cancelling because they're signing waivers and to just go one step further, what you just said about waivers and the law.

Let me tell you what they did in North Carolina. Legislature met in a special session and to protect doctors, they had taken age of majority in malpractice cases from 18 down to 7 years. So with the statute of limitations, for years a case must be pursued and followed no longer than 3 years after that. Now my thought is, and the attorneys are fighting it, they think it's unfair. The doctors are screaming, "we got to have it or we're not going to practice" and really what happens is I can't believe that sooner or later they are not going to drop the age majority down for all cases. And maybe they'll just be able to stick to malpractice cases, I don't know. But that has happened in North Carolina. I'm waiting for someone to get into a long discussion on waivers, but I think there's been a considerable work in that area. Where everybody responded, some 25 states that have the independent activities where a kid in Vermont can go skiing on his own and can get creeor physical education. They're using the waiver as their protection. Believe me it won't hold up.

Peters: If you abide by what the law is in your particular state as of today, then you could be in serious trouble. You have to take a worst case approach. Look to the worst and organize your program, then you have a safety margin. For example, an injury may occur to a 15-year-old girl. The lawyer will get the case but he knows he can wait until she's 18, and knows it won't go to trial for 3 years, so he has six years for the law to change into what he thinks it's going to be. Law applied at the time of trial is the law in existence at the time of the trial. So if you conform to today's law in your state, the law may be changed next week. You have to take the worst case, know what the trend is, and build in a certain safety factor for yourself.

Question #5. We understand that many hospitals and doctors will not undertake major surgery for even some emergency procedures without the necessary parent's consent. What effect does this have on a coach that is on the road, on an away trip out of town, when a youngster does get seriously injured? Will the permission slip provide the hospital with permission to do this type of thing?

Appenzeller: What we do in North Carolina, if there's an emergency situation, we try to contact the parent, of course. But let's say they are away, they can't. In North Carolina the doctors usually will get two or three others to consult, and say "Yes, this is necessary," so that one doctor alone hasn't said the decision to operate had to be made right away. So they will get two or three.

What we have done is to have our team physician who is very interested in this particular area use a form. I just have one I don't know if I brought it with me or not. I've got an extra copy of this if you just want to take it. What we ask our athletes to do, remember that our men and our women are now at the age of majority, we feel that they are in different categories. Our doctor has taken this form and he uses it with the high school. And what it simply says is "As a parent or legal guardian I authorize Dr. So and So to do certain things if he can't get in touch with me and there is an emergency." And then at the bottom "In the absence of the team or authorized physician, I grant permission to a qualified physician to furnish emergency care using the guidelines above." We know our doctor can't go 350 miles up to Towson, MD. the trainer has a list of all of our athletes that have signed and we tell him, if there is an emergency and the other doctor at the hospital has to use it, he sees a copy of the form and is informed that this has been signed, which we think helps. The doctors feel more comfortable if they can see something like this. I don't know who writes administration books, but they write books and they say that you should conduct no practice where there is contact without a doctor present. Now! who in the world has ever been in the real world and writes something like that, I'll never know.

A coach in New Jersey asked me the very question. He said "What do you do when you know nothing about injuries. There's no doctor available and there's no ambulance and the boy gets hit in the head with a baseball. He's your boy and dies?" You know, I've had many situations where if you had to operate immediately, I could not contact the parents. And I know of one coach who signed and he said "Operate" because they said certainly the boy wouldn't live if they didn't operate.

We have a form here. I'm very skeptical about waivers. But we do have this for our players to sign. If you'd like a copy I'd be glad to give you one. They're doing one for the NAIA, that is a new form, which is similar to this one. The parent can sign and then the athlete can sign.

Peters: The law is a little difficult for a lot of people to understand, because you can never get a clearcut answer. You have to remember that we live in a country where there are over 50 different sets of laws. It's the common law of each state that applies. So you have to contact your own attorney and find out, for example, if, in your state, there is a Good Samaritan Law. If the physicians perform emergency services, whether there is no liability because of statutory provisions. Even if these cases go to a jury, the jury uses an awful lot of common sense. In medical malpractice cases, some of you may disagree with me, but if the medical malpractice is ordinary negligence, the jury tolerates a great deal. Generally, there is liability only when there's a gross departure from due care. Something really shocking. Because the citizens are aware of the medical malpractice crisis; they are very conservative when they serve as jurors.

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